Certificate of Need Application Form
Version 03.2011

Name of Applicant	**East Bay Comprehensive Cancer Care, LLC**
Title of Application	**Freestanding Radiation Therapy and Physician Services Facility**
Date of Submission	**June 11, 2012** **Revised July 3, 2012**
Type of review	√ Regular Review _____ Accelerated Review (provide letter from the state agency) _____ Expeditious Review (complete Appendix A)
Tax Status of Applicant	_____ Non-Profit √ For-Profit

Pursuant to Chapter 15, Title 23 of The General Laws of Rhode Island, 1956, as amended, and Rules and Regulations for Determination of Need for New Health Care Equipment and New Institutional Health Services (R23-15- CON).

All questions concerning this application should be directed to the Office of Health Systems Development at (401) 222-2788.

Please have the appropriate individual attest to the following:

"I hereby certify that the information contained in this application is complete, accurate and true."

Sarah Flaherty 7/3/12

signed and dated by Sarah Flaherty, Chief Executive Officer

612885.1

Table of Contents:

PROJECT DESCRIPTION AND CONTACT INFORMATION

1.) Please provide below an Executive Summary of the proposal.

In 2002, 21st Century Oncology ("21st CO") began its mission to bring state-of-the-art radiation oncology services and technology to the underserved communities throughout the State of Rhode Island. 21st CO applied for and was awarded its first Certificate of Need ("CON") to design, equip, staff, and operate a state-of-the-art radiation oncology facility in a joint venture with Landmark Medical Center known as Southern New England Regional Cancer Center ("SNERCC"). Since that time, 21st CO has applied for and has been granted three additional CONs. The second CON brought high quality radiation therapy to another underserved demographic through a joint venture with South County Hospital, known as South County Radiation Therapy ("SCRT").

The third CON was granted in 2005 which created a joint venture between 21st CO and Roger Williams Medical Center known as Roger Williams Radiation Therapy ("RWRT"). 21st CO remodeled the aging radiation therapy physical plant at Roger Williams Medical Center and added state of the art linear accelerator technology, including a new CT simulator and treatment planning system. In 2007, 21st CO acquired the sole rights in Rhode Island to acquire and operate a dedicated stereotactic radiosurgery device known as the CyberKnife. In a collaborative, cooperative effort, 21st CO approached Rhode Island Hospital and initiated a joint venture known as RadioSurgery Center of RI to make this new technology available to citizens of RI and residents in training at Brown University.

The Applicant, East Bay Comprehensive Cancer Care, LLC ("East Bay"), will bring the same state-of-the-art technology and high quality compassionate care to the Bristol demographic, which is both practically and statistically underserved for the purposes of cancer care. East Bay is 100% owned by New England Radiation Therapy Management Services, Inc. ("NERTMSI"), which in turn, is 100% owned by Radiation Therapy Services, Inc. ("RTSI"). East Bay will lease premises in a state-of-the-art facility to be constructed by a third party and will purchase a linear accelerator with CT simulator and treatment planning system to provide state of the art radiation therapy services. The lessee of the capital lease will be the applicant. The lessor has not been determined at this time in order to maximize the most favorable lease terms at the time of implementation.

The facility will provide radiation therapy and will enhance a variety of efforts to improve cancer care in the east bay. It will, for example, organize and work collaboratively with others to provide cancer screenings and public awareness programs that educate area residents on cancer risk factor reduction, prevention and treatment. It will collect and disseminate information on other similar screenings and education programs in the area as well as information on clinical trials in which it participates or are otherwise available in Rhode Island. The proposed program will also provide necessary data for cancer surveillance efforts.

As a provider of services used by the majority of cancer patients, the program will serve as an important hub of communication among area providers involved in various aspects of cancer

care. The process of coordination of care with other providers will create opportunities for consultation and collaboration within the local system of services.

In addition, East Bay will utilize the expertise of RTSI, its parent company and the largest provider of radiation therapy services in the United States. This will enhance efforts to recruit qualified staff, provide in-service training and maintain current knowledge of radiation therapy among providers in the area.

Accordingly, approval of this Application will ensure state of the art, high quality, radiation therapy provided in that patient's own community with maximum access to support of family and friends. At the same time, it will enhance the broader plans within the community to improve efforts to address the burden of cancer.

2.)

Capital Cost	**$5,230,000**	From responses to Questions 10 and 11
Operating Cost	**$2,962,000**	For the first full year after implementation, from response to Question 18
Date of Proposal Implementation	**April / 2014**	Month and year

3.) Please provide the following information:

Information of the applicant:

Name:	**East Bay Comprehensive Cancer Care, LLC**	Telephone #:	**401-274-7200**
Address:	**c/o Patricia K. Rocha, Adler Pollock & Sheehan P.C., One Citizens Plaza, 8th Floor, Providence**	Zip Code:	**02903**

Information of the facility (if different from applicant):

Name:	**Plat 128, Lot 15**	Telephone #:	
Address:	**Bristol, Rhode Island**	Zip Code:	

Information of the Chief Executive Officer:

Name:	**Sarah Flaherty**	Telephone #:	**401-450-4465**
Address:	**115 Cass Avenue, Woonsocket, RI**	Zip Code:	**02895**
E-Mail:	**sflahert@rtsx.com**	Fax #:	**401-356-4537**

Information for the person to contact regarding this proposal:

Name:	**Patricia K. Rocha**	Telephone #:	**401-274-7200**
Address:	**Adler Pollock & Sheehan P.C., One Citizens Plaza, 8th Floor, Providence, RI**	Zip Code:	**02903**
E-Mail:	**procha@apslaw.com**	Fax #:	**401-351-4607**

4.) Select the category that best describes the facility named in Question 3.

[ ] Freestanding ambulatory surgical center
[ ] Home Care Provider
[ ] Home Nursing Care Provider
[ ] Hospital
[ ] Hospice Provider
[ ] Inpatient rehabilitation center (including drug/alcohol treatment centers)
[ ] Multi-practice physician ambulatory surgery center
[ ] Multi-practice podiatry ambulatory surgery center
[ ] Nursing facility [X] Other (specify): Organized Ambulatory Care Facility

5.) Please select each and every category that describes this proposal.

A. ___ construction, development or establishment of a new healthcare facility;
B. ___ a capital expenditure for:
   1. X health care equipment in excess of $2,250,000;
   2. ___ construction or renovation of a health care facility in excess of $5,250,000;
   3. ___ an acquisition by or on behalf of a health care facility or HMO by lease or donation;
   4. ___ acquisition of an existing health care facility, if the services or the bed capacity of the facility will be changed;
C. ___ any capital expenditure which results in an increase in bed capacity of a hospital and inpatient rehabilitation centers (including drug and/or alcohol abuse treatment centers);
D. ___ any capital expenditure which results in an increase in bed capacity of a nursing facility in excess of 10 beds or 10% of facility's licensed bed capacity, whichever is greater, and for which the related capital expenditures do not exceed $2,000,000
E. X the offering of a new health service with annualized costs in excess of $1,500,000;
F. ___ predevelopment activities not part of a proposal, but which cost in excess of $5,250,000;
G. ___ establishment of an additional inpatient premise of an existing inpatient health care facility;

H. X tertiary or specialty care services: full body MRI, CT, cardiac catheterization, positron emission tomography, linear accelerators, open heart surgery, organ transplantation, and neonatal intensive care services. Or, expansion of an existing tertiary or specialty care service involving capital and/or operating expenses for additional equipment or facilities;

HEALTH PLANNING AND PUBLIC NEED

6.) Please discuss the relationship of this proposal to any state health plans that may have been formulated by the state agency, including the Health Care Planning and Accountability Advisory Council, and any state plans for categorically defined programs. In your response, please identify all such priorities and how the proposal supports these priorities.

The primary mechanism for establishing statewide goals for cancer treatment is the Rhode Island Comprehensive Cancer Control Plan – 2007. This plan sets forth the goals and objectives of the Partnership to Reduce Cancer in Rhode Island. This Partnership represents a broad base of cancer interests, including medical professionals, hospitals, public health groups, business, government, community-based organizations, advocates, and foundations, physical and other specialty therapists, spiritual leaders, minority communities, and cancer survivors.

The Partnership is actively engaged in implementing the 2007-2012 State Plan to Reduce Cancer in RI through a series of focused workgroups. As the plan states, the mission of this organization is to reduce the burden of cancer for the residents of Rhode Island. The Plan's primary goals and objectives are to "ensure Rhode Islanders have access" to prevention services, detection and screening, treatment, survivorship assistance and palliative care. In addition, The Collation seeks to promote research, advocate on cancer issues and use surveillance and evaluation to continuously improve the care process. The Comprehensive Cancer Control Plan guides the activities of the partnership and includes several goals that the proposed project will clearly advance.

As a major provider of cancer treatment services in the area, the Applicant will undertake various activities to address the goals set forth in The Comprehensive Cancer Control Plan including activities aimed at prevention, coordination of care and area-wide improvement in early detection and treatment.

The table below identifies the goals of the cancer plan and the various activities The Applicant will undertake to contribute to their achievement.

#	Goal Description	Explanation	Impact of the Proposal
1	Reduce cancer risk through changes in behavior, policies and environment that promote healthy lifestyles.	The priorities are to focus on reduction of tobacco, obesity, and sun exposure, as well as an increase in the rates of physical activity, the HPV vaccine coverage, breast feeding and physical activity as prevention measures.	The Applicant will work with the local community of providers, health agencies and health advocacy groups to organize, promote and conduct education and screening programs for service area residents. These programs will include information about lifestyle and environmental changes that minimize cancer risks, including such factors as diet, sun exposure, exercise, smoking cessation and avoidance of exposure to carcinogens. These programs will also stress techniques for self-assessment of risk exposure and recognition of warning signs cancer. Special emphasis will be placed on early detection and the need for appropriate primary care services (such as the HPV vaccination) as means of avoiding or minimizing the occurrence of cancer. Information will be provided on services available in the area can assist with life-style changes (e.g., nutrition services, gyms, environmental testing, addictions counseling and smoking cessation.) Each public awareness program will provide screenings for one or more forms of cancer that are prevalent in the service area. Information about other free screenings available locally will also be provided. These programs will be provided at no charge. Periodically, special versions of these programs will be provided to meet the target needs of special populations, such as minorities, the elderly and women.
2	Increase proven, science-based cancer screening rates among all segments of the population in Rhode Island.	Increase colorectal cancer screening rates through increased access and affordability is the priority for screening in Rl. Breast, cervical, prostate and skin cancer screening are also important in reducing the burden of cancer through early detection.	All significant types of cancer will be addressed in the course of providing the Public Awareness programs described above. The Applicant expects these activities (along with provision of information about other screenings available in the community) to increase screening rates throughout the service area population. In order to enhance the effectiveness of these efforts, these programs will stress the importance of evidence-based prevention and detection. Evidence based techniques for screening, self-assessment and risk reduction will be discussed and employed. These programs will be provided free of charge. Additionally, information about other free or low cost screening services will be provided, as well as sources of financial assistance available for such services.

3	**Ensure access to cancer care for all residents of Rhode Island.**	**Increased access to healthcare and cancer treatment for all Rhode Islanders is essential for decreasing cancer mortality and disparities.**	**Radiation therapy is an essential component in the treatment of a wide range of cancers. The proposed project will increase the supply of these services in a significant geographic region of the state in which no treatment facilities presently exist.** **The project will also contribute to the effectiveness of radiation therapy by facilitating patient compliance with treatment recommendations. Radiation therapy can be an arduous and difficult process for patients extended over many weeks or months. Given the nature and preponderance of side effects (and the fact that many patients are already very ill), a significant percentage of patients fail to complete the full course of treatment. While there are many reasons for this, the medical literature demonstrates (See Tab 1) that patient compliance is reduced in relation to increases in distance or travel time to therapy. The Applicant's proposal substantially reduces travel time for a large population that experiences a substantial cancer burden (See responses to Question 7 below).** **The Applicant's charity care policies, described further below, will help to minimize financial barriers to the use of treatment. Persons with low income constitute one of the largest population groups suffering disparities in health and health services. In addition, as described in response to Goal 5 below, the Applicant's efforts to enhance the treatment experience will further promote access and support compliance with treatment needs.** **Collectively the impact of these benefits and others described above will result in lower cancer incidence, earlier detection and higher quality care. All of these impacts are associated with lower cancer mortality rates.**

4	Improve the quality of cancer treatment provided in Rhode Island.	RI is working to lave 100% of the acute care at RI hospitals approved by the American College of Surgeons Commission on Cancer (ACOS COC) approved.	ACOC accredited Hospital Cancer Centers must meet various requirements involving coordination of care, multidisciplinary treatment planning, data submission to cancer registries, quality improvement processes and similar activities. The Applicant's parent corporation maintains three joint ventures with hospitals in Rhode Island: Landmark Medical Center, South County Hospital and Roger Williams Medical Center. All of these facilities have ACOS accreditation. As an experienced provider of radiation oncology, the Applicant maintains procedures for assisting accredited hospitals meet ACOS requirements. This includes participation in multidisciplinary treatment planning, collection of registry data, participation in quality improvement initiatives, use of appropriately credentialed staff and many similar requirements. The Applicant notes the proposed program will obtain accreditation from ACRO, the standard for all free standing radiation facilities. The Applicant's program includes many other activities that ensure and enhance the quality of treatment provided. Treatment planning and monitoring for each patient, for example, is conducted in collaboration and coordination with other providers involved with the care of that patient. Progress is routinely communicated, discussed and treatment plans are reassessed throughout the process. The Applicant also maintains an internal process of continual service improvement. This entails continual monitoring of patient outcomes, identifying opportunities for improvement and modifying care processes accordingly. As the largest provider of radiation therapy in Rhode Island, the Applicant draws upon the experience, resources and operational processes of a parent corporation that is one of the largest providers of this service throughout the country. This relationship provides access to sophisticated quality monitoring, benchmarking and improvement programs and an unusually broad range of medical expertise. In the course of all of these and other efforts, the Applicant takes all necessary steps to protect patient privacy. Methods of communication and collaboration are conducted through secure mechanisms that comply with all applicable codes and regulations.

5	**Enhance the treatment experience for cancer patients.**	**The treatment experience for cancer patients can be enhanced through linguistically and culturally appropriate educational and supportive services.**	**Patient comfort is a particularly important aspect of radiation oncology and is paramount in the Applicant's approach to the provision of care.** **The Applicant employs a patient centered treatment model focused upon each patient's clinical, social, financial and cultural needs. These are evaluated and addressed prior to the initiation of treatment and continually reassessed throughout the entire course of care.** **Importance is also placed on keeping the patients and their families well informed at each stage of the treatment process. Prior to the initiation of treatment, each patient is provided with an orientation to their care, including clear explanation of the processes and procedures they will experience and the approaches that will be used to minimize discomfort and promoting good outcomes.** **These orientations will be provided to the patient and family members in a culturally appropriate manner. Translation services will be arranged when necessary.** **Patients and their families will be advised of the supportive services routinely available to all, as well as options for patients with special difficulties such as transportation assistance or help at home.** **As care progresses, patient's comfort and needs will be continually reassessed and changes made as determined by the patient and the patient's caregivers.**

6	Reduce workforce gaps and ensure an adequate supply of diverse and highly trained professionals in all aspects of cancer care and control.	A diverse and well-trained workforce is essential for providing cancer prevention, early detection treatment and support services. This includes a workforce that is demographically representative of and culturally sensitive to the local population.	The Applicant will rely upon the experience and resources of its corporate partner for assistance in recruiting appropriately qualified staff. Staff recruitment will seek, as possible, to draw from the local supply of professionals in the expectation that the staff composition will reflect the composition of local culture and demographics. In-service training will include components regarding cultural sensitivity and communication processes. As mentioned above, medical interpretation services will be available as needed. While the Applicant does not anticipate difficulty with nurse recruitment (given the broad recruitment capabilities of its parent). To the extent that nurses are recruited from outside the area, their recruitment will help to alleviate local nursing shortages. In addition to cultural sensitivity as mentioned above, the Applicant's in-service training programs and training requirements will also be designed to enhance the technical skills of staff. Through its efforts to work and communicate with primary care physicians and area specialists, the Applicant will seek to ensure that the local environment for cancer care is effective, collaborative and collegial. The Applicant believes that such an environment will encourage the establishment and expansion of physician practices in the area. Another aspect of this effort will include special in-service orientations for non-physician staff that work in other areas of cancer care – such as chemotherapy or surgery. The purpose of these sessions will be to promote and maintain knowledge of radiation therapy among these other related disciplines. The Applicant believes that this type of understanding is necessary to promote effective coordination of care and understanding of all issues impacting patients. The Applicant will seek to make the local system an effective practice locale that encourages other providers to establish or expand practices.
7	Increase awareness, access, and participation in cancer clinical trials by Rhode Island residents.	In order to improve participation in clinical trials, this plan proposes a baseline assessment of cancer clinical trials, and activities that will increase public and provider awareness of clinical trials in RI.	The Applicant will support the protocols of patients participating in clinical trials including the collection and submission of data as necessary. The Applicant will develop and maintain a directory of clinical trials being conducted in RI and will utilize this information in treatment planning in coordination with the patient's primary clinical provider. In addition, the Applicant will make this information available to patients as appropriate and routinely circulate it to other providers of cancer care in RI.

8	Improve access to palliative care for all patients seeking end-of-life care due to cancer in Rhode Island.	Cancer patients seeking end-of-life care should be informed about and have access to a palliative, hospital and end-of-life care if desired.	Palliative care and symptom management is an important part of radiation therapy. The patient's progress and ability to tolerate their treatment are factors that are continually assessed throughout treatment. These issues are routinely communicated to and discussed with the patient's primary cancer caregiver. Palliative care is provided frequently to patients for the side effects of their treatment and other issues. The Applicant works to facilitate transition to end of life care for all patients who desire it. While there are times when the Applicant presents this option to patients, this issue is primarily a matter for discussion between the patient and their primary cancer caregiver. Use of palliative care will be frequent and extensive and patients will be informed of their options before they begin treatment at all times during treatment.
9	Promote the well being and quality of life of Rhode Islanders who are living with, through, and beyond cancer	A new recognition of the importance of survivorship services focuses on assessing the current services, gaps, and a plan for improvement for the growing number of cancer survivors and their caretakers.	While providers of radiation therapy are not typically the primary care coordinators for their patients, the Applicant routinely makes information about survivorship programs available to patients during treatment orientation, in community education programs and throughout the course of treatment. Information, in particular, is regularly provided regarding the programs available through the Survivors' Network of the American Cancer Society. In conjunction with each patient's primary care provider, patients are encouraged to familiarize themselves with ACS Survivorship Network services and access them as needed.
10	Assure the use of timely, complete, and accurate cancer surveillance data in the planning, management and evaluation of cancer control programs	In order to make informed decisions, track progress, evaluate success and plan for the future, it is essential to maintain the integrity of the data surveillance systems in the state.	Treatment planning is an essential part of the process of radiation therapy services. The Applicant, like similar providers, maintains extensive technology and invests considerable time to determine the best possible methods and dosages for providing each patient's course of treatment. As treatment progresses, these treatment plans are discussed with the patient's other providers and reassessed in terms of results to date. Extensive efforts are made to develop and maintain the accuracy of this data. As described above, this information contributes significantly to internal planning and quality improvement efforts. It is also shared in a manner allowed by law with local and national registry systems.

7.) On a separate sheet of paper, please discuss the proposal and present the demonstration of the public need for this proposal. Description of the public need must include at least the following elements:

A. Please identify the documented availability and accessibility problems, if any, of all existing facilities, equipments and services available in the state similar to the one proposed herein:

Name of Facility/Service Provider	List similar type of Service/Equipment	Documented Availability Problems (Y/N)	Documented Accessibility Problems (Y/N)	Distance from Applicant (in miles)
RSCRI	CyberKnife	N	N	15
Rhode Island Hospital	LINAC High Energy	N	N	15
Rhode Island Hospital	LINAC High Energy	N	N	15
Rhode Island Hospital	LINAC High Energy	N	N	15
Roger Williams Medical Center	LINAC High Energy	N	N	17
Radiation Oncology Assoc.	LINAC 4MEV	N	N	17
Radiation Oncology Assoc.	LINAC 6 MEV	N	N	17
Radiation Oncology Assoc.	LINAC High Energy	N	N	17
Dr. Maddock	LINAC <10MEV	N	N	14
Dr. Maddock	Cobalt Unit	N	N	14
SNRCC	LINAC High Energy	N	N	31
South County Hospital	LINAC High Energy	N	N	37
Charlton Memorial Hospital	LINAC High Energy	N	N	19
St. Anne's Hospital	LINAC High Energy	N	N	17
St. Anne's Hospital	LINAC High Energy	N	N	17

The chart above includes 12 machines located in Rhode Island and three located in Massachusetts within the Applicant's secondary service area. The CyberKnife unit at Rhode Island Hospital is included among the machines located in Rhode Island.

Documentation of Availability and Accessibility Problems:
Comprehensive data on utilization of radiation therapy for each area unit listed above is not available to The Applicant by program or by patient. The Applicant therefore cannot provide quantified documentation of problems in availability or accessibility for specific programs or specific patients. Evidence is available, however, that indicates the need radiation therapy capacity in order to meet the needs of the residents of the proposed project's service area. This evidence is provided below response to question 6B.

B. Please discuss the extent to which the proposed service or equipment, if implemented, will not result in any unnecessary duplication of similar existing services or equipment, including those identified in (A) above.

Current Use Patterns

At present, there are no radiation therapy units located within the Applicant's Primary Service Area. All persons in need of these services obtain them at other facilities located elsewhere. There are three units located in the Applicant's Secondary Service Area as noted above.

Although comprehensive patient and utilization statistics are not available to Applicant for radiation therapy programs, the Applicant has prepared the following estimate of treatment patterns for service area residents. These estimates were based on discussions with area physicians and local program administrators. They demonstrate that no patients are obviously treated in the proposed Primary Service Area ("PSA") because of the lack of any service capacity located there.

Given the consensus developed from discussions with area providers, the Applicant estimates a 10% cross migration of patients between Rhode Island and Massachusetts for radiation therapy. That is approximately 10% of area patients utilize facilities in Massachusetts while a similar number of MA residents use facilities in Rhode Island. The Applicant has therefore assumed that 10% of PSA patients are treated at facilities located in the Secondary Service Area ("SSA") or elsewhere in MA. For purposes of preparing the summary below we have assumed that all of these patients use the services located in the SSA (although in fact, some may use other MA facilities.)

Finally, our discussions with local providers revealed that not all residents of the SSA utilize the services located there. Based on these discussions, we have therefore estimated that approximately 25% of SSA patients obtain treatment elsewhere in MA or Rhode Island.

Estimated Location of Existing Treatment

Area of Residence	Location of Treatment			
	Patients	PSA	SSA	Other
Primary Service Area	367	0	37	330
Secondary Service Area	327	0	82	246
Total	694	0	119	576

The Proposed Services are Not Duplicative

The Applicant assessed the potential for duplication of services from three perspectives. First we examined the extent to which the implementation of the proposed service would duplicate the services already located within the project's Secondary Service Area. These include the three linac machines located in Fall River identified above.

Secondly, we evaluated the potential for duplication of all existing services provided in Rhode Island. This included consideration of the entire statewide supply of services and the extent to which increased supply of these services would result in unnecessary capacity.

Finally, we considered the impact of the proposed from the perspective of the geographic distribution of services and the extent to which issues of geographic distribution (taken in conjunction with capacity and utilization) impacts the possibility of duplication of services. These analyses are described below.

Services Located within the Applicant's Secondary Service Area

As indicated above, there are three linac units located within the proposed project's Secondary Service Area ("SSA"). These are well established programs that are utilized by approximately 25% of those residents of the SSA that require radiation therapy. Additionally, up to 10% of Primary Service Area ("PSA") residents also use these services. This results in the use of these facilities by a combined total of approximately 120 service area residents each year. One hundred and twenty patients annually are very unlikely to account for a substantial proportion of the total utilization of three linacs. The proposed project therefore poses no significant risk of duplicating these services.

Services Located within Rhode Island

The most recent comprehensive assessment of radiation therapy services in Rhode Island was provided in Cyber Knife Needs Assessment: Rhode Island 2007 (CyberKnife Report). This report assesses supply and capacity based on actual data from 2000 to 2007 and projected data from 2008-2012. The report was based on a survey of providers conducted by the RI Health Department. This report found that additional radiation therapy capacity was needed at that time because "radiation therapy equipment in Rhode Island will be operating at above working capacity (80%) in 2008" (Pg. 9). This additional unit was subsequently authorized with the approval of Rhode Island Hospital's CON Application for a CyberKnife unit and is reflected in The Applicant's response to Question 6A above.

The CyberKnife Report points out as well that the annual need for radiation treatment has been growing and that this growth was projected to continue at a rate of 1% per year. Continued growth has since been confirmed by more current assessments – most notably the December, 2010 study published by the American Society for Clinical Oncology: The Future of Radiation Oncology in the United States From 2010 to 2020: Will Supply Keep Pace With Demand? (Journal of Clinical Oncology –12/10.) This study projects that the number of persons requiring radiation therapy will grow by an average of 2.2% in the current decade.

The findings of The CyberKnife Report regarding capacity and utilization are summarized as follows:

Operational Demands on Working Capacity Actual & Projected 2000-2012

Year	Units	Utilization	Working Capacity	Implied % Over (+) / Under (-) Working Capacity
2000	11	81%	80%	-1%
2001	11	82%	80%	-2%
2002	11	85%	80%	-5%
2003	11	85%	80%	-5%
2004	11	77%	80%	+3%
2005	11	78%	80%	+2%
2006	11	80%	80%	0%
2007	11	79%	80%	-1%
2008	11	81%	80%	-1%
2009	11	81%	80%	-1%
2010	11	82%	80%	-2%
2011	11	83%	80%	-3%
2012	12	74%	80%	4%*

Summarized form: "working capacity" definition from Assessment: RI 2007
**Corrects for an error in The CyberKnife Report.*

As this data demonstrates, the necessary volume of procedures projected by The CyberKnife Report to be needed in the current year is less than 8% below working capacity of 80% even after the addition the CyberKnife unit at Rhode Island Hospital. Given increasing need for these services, implementation of the proposed unit will not result a duplication of services.

Impact on Statewide Utilization in Rhode Island

The following Table provides two alternative service need projections for 2012 and beyond. These include estimates based on the growth rate projected in the CyberKnife Report (A) and an alternative estimate based on the more recent mentioned above by the ASOC. The base volume level used for each scenario is the estimate projected in the CyberKnife Report for 2008.

Estimated Annual Utilization
Radiation Therapy Capacity RI

Year	Units	Unit's Needed Scenario		Utilization Rate Scenario	
		A	B	A	B
2012	12	9.2	9.3	77%	78%
2013	12	9.3	9.5	78%	79%
2014	12	9.4	9.7	78%	81%
2015	12	9.5	10.0	79%	83%
2016	12	9.6	10.2	80%	85%

As this Table demonstrates, the system will be at or above working capacity by the time the proposed unit is in its first full year of operation in 2015.

Geographic Distribution of Services

The discussion above assesses the need for additional services in terms of the combined capacity of units across broad geographic regions. This is the approach taken by The CyberKnife Report in evaluating the need for additional capacity in Rhode Island. In taking this perspective, The CyberKnife report also acknowledges variations in utilization by providers. That is, it demonstrates that some providers operate at higher capacity than others and that some providers have unused capacity while others operate close to or above their working capacity.

In reaching its final conclusions, The CyberKnife Report takes into account the need for geographic balance in the distribution of services when assessing the requirement for additional capacity. That is, despite the fact that some providers in outlying areas have excess capacity, The CyberKnife Report finds that the addition of a new unit is still necessary in order to avoid "additional travel time by patients." In making this observation, the report notes further that "Avoiding such travel was one of the reasons for approving CON Applications for these outlying sites in the past." This reasoning acknowledges the concept that duplication depends on geographic proximity as well as utilization rates and that both should be taken into consideration.

The medical literature similarly supports this concept. It documents findings that extended travel times for therapy can undermine the delivery of radiation treatment due to patient difficulties in tolerating these arduous long term therapies. The literature demonstrates that patient's have a tendency to obtain fewer radiation treatments than required as their travel time or distance to their treatment center increases. Given the impact of this issue, The Applicant has provided a detailed discussion and accompanying documentation in Tab 1.

Conclusion

As demonstrated by the discussions above, the proposed project will not duplicate existing services in Massachusetts or Rhode Island. Although some providers may have some unused capacity, this capacity will not be duplication given the need to balance effective geographic distribution of services against efficient concentration of services as reflected in The CyberKnife Report and suggested by the medical literature.

C. Please identify the cities and towns that comprise the primary and secondary service area of the facility. Identify the size of the population to be served by this proposal and (if applicable) the projected changes in the size of this population.

See Tab 2. The Applicant's primary service area includes seven Rhode Island cities/towns with a current combined population of over 130,000. This population is expected to remain stable or decrease very slightly over the next five years. This population includes a large portion of persons over 65 which, at 16.9%, is substantially above the statewide average. This population segment is projected to increase in proportion to the total population over the next five years.

The primary service area represents the core population to be served by the proposed project. The Applicant's effort will be focused primarily on meeting the needs of the Rhode Islanders within the context of the state's health care system. Nevertheless, given the proximity of certain Massachusetts cities and towns, The Applicant expects that many of these residents will seek its services. This population resides within three localities in Massachusetts. These areas constitute the project's secondary service area and it includes almost 120,000 residents. This population is younger and more financially distressed than residents of the PSA and is also expected to decline slightly over the next 5 years.

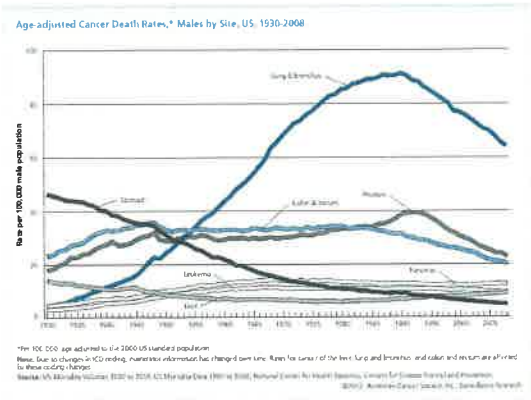
D. Please identify the health needs of the population in (C) relative to this proposal.

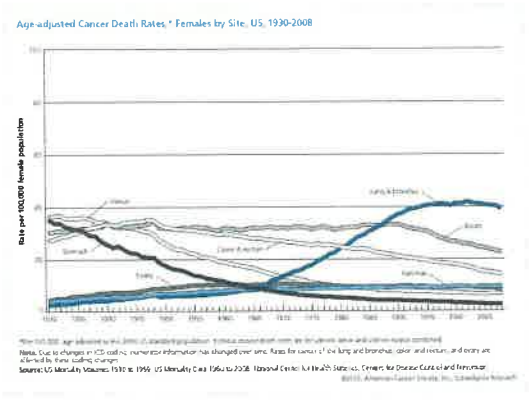
Cancer is the second leading cause of death in the US. The cancer burden across populations varies substantially by age, sex and race and by geography.

The populations of both Massachusetts and Rhode Island experience higher rates of cancer on average than the nation as a whole. This is true of the population as a whole but varies with other factors. The following table compares the annual incidence of cancer among residents of Massachusetts and Rhode Island to the US average for all races and for Blacks and Hispanics. As the table demonstrates, rates of all races combined are substantially higher than the national rate. Blacks and Hispanics suffer a somewhat lower burden than others, with Blacks in both states having a lower incidence than all races and than the national average. Hispanics, on the other hand suffer a higher than average burden but nevertheless a lower burden than all states combined.

Comparison: Cancer Rates Per 100,000 Population			
All Cancer Sites			
	All Races	Black	Hispanic
US	465	477.8	361.6
RI	511.7	456.1	498.7
MA	503.5	448.3	418.8
SEER System based on 2004-8 surveillance period			

Cancer varies in its impact on men and women. The charts below illustrate the dramatic difference in mortality rates for lung cancer between the genders.





Approximately 66 percent of all cancers that occur each year require radiation therapy for some period of time. At the same time, about 40% of all patients receiving this therapy in a given year were previously diagnosed and treated. The volume of radiation therapy required by a given population is a function of many variables, including the age and gender mix of the population, the mix of cancer types and the availability of treatment.

The most recent survey of radiation therapy volumes is provided in <u>CyberKnife Needs Assessment in Rhode Island</u>. This report includes a survey of provider volumes and projects these forward from 2007 to the current year. While it's difficult to know the accuracy of these projections, they represent the only recent estimate based on an actual survey of providers. The Applicant utilized these projections in estimating the need for radiation therapy in the service area for the proposed project. This estimate is as follows:

Estimate of Need for Radiation Therapy Visits		
1.	Visit Rate per 100,000 persons based on the CyberKnife Report	6,911.4
2.	Primary Service Area Population	132,763
3.	Primary Service Area Visits Needed	9,176
4.	Secondary Service Area Population	118,444
5	Secondary Service Area Visits Needed	8,186
6.	Total Visits Needed	17, 362

E. Please identify utilization data for the past three years (if existing service) and as projected through the next three years, after implementation, for each separate area of service affected by this proposal. Please identify the units of service used.

Actual (last 3 years)	FY____	FY____	FY____
Hours of Operation	N/A	N/A	N/A
Utilization (#)			
Throughput Possible (#)			
Utilization Rate (%)			

Projected	FY 2014	FY 2015	FY 2016
Hours of Operation	8am-5pm	8am-5pm	8am-5pm
Utilization Patient Treatment	2,600	3971	4150
Throughput Possible	4,000	6000	6,000
Utilization Rate (%)	65%	66%	69%

The Applicant is confident in the projections provided above and notes that they are consistent with start-up trends at its other RI based facilities. In evaluating the volumes reported in the Zimmerman analysis of 2007, it is important to note that both the LMC and SCH units were recent start-up programs and that the unit at Roger Williams had experienced a temporary shut-down in 2006 and had only been back in operation for less than 12 months at the time of the report. It is also worth noting that as of the current date, annual volumes for Roger Williams, SCH and SNERCC are 7987, 5441 and 2587, respectively (yearly volumes extrapolated from year-to-date numbers through end of May).

F. Please identify what portion of the need for the services proposed in this project is not currently being satisfied, and what portion of that unmet need would be satisfied by approval and implementation of this proposal.

The Applicant estimates that a substantial portion of the need for radiation therapy services cannot be accommodated by existing capacity in the state and as a result there is unmet need throughout the state. These estimates are based on comparisons of disease and treatment rates between Rhode Island and the nation as a whole. As the following table demonstrates, statewide radiation treatment rates are well below the national average while at the same time, rates of occurrence and death from of cancer is substantially higher.

Comparison: RI vs. US
Cancer Rates vs., Radiation Visits
Rates Per 10,000 Pop.

	Incidence	Mortality	Visits
US	465	178.7	780
RI	507.9	180.4	637
Difference	9%	1%	-18%

Sources: *SEER 2005-2009 Series*
2004 IMV Medical, Information Div.
Visits: RI 2004

The difference demonstrated in this Table suggests that an additional 143 radiation therapy visits per 10,000 population are needed in RI not including adjustments for the higher rate of incidence or mortality in the state. While this difference may be attributed to a variety of causes, it shows that the actual use in Rhode Island is approximately 20% below that which would be expected given the rate of cancer among the state's population.

This deficit in capacity is not necessarily at odds with the findings of the CyberKnife or Zimmerman Report. That analysis assessed the need for additional capacity based upon the historical use of services and not on assessment of population need. The volume projections developed in the Report from 2007 thru 2012 are based on historical volumes trended forward.

As discussed above the surplus of 1.8 units in 2012 is eliminated when further growth in utilization is taken into consideration and Mr. Zimmerman's measure of "working capacity" is taken into account. The analysis of unmet need further demonstrates that the proposed unit will not duplicate other services in Rhode Island.

With respect to Massachusetts, the Applicant also found similar discrepancies in incidence and mortality rates (500 and 180 per 10,000 respectively.) Total volume of radiation treatment visits for Massachusetts is unavailable to the Applicant so the Applicant cannot provide a quantified estimate of unmet need.

With respect to the Applicant's service area, the analysis above suggests an unmet need of as many as 1,800 visits or 20% above the 9,100 visits presently projected in response to Question & D above. The proposed project will accommodate this need.

G. Please identify and evaluate alternative proposals to satisfy the unmet need identified in (F) above, including developing a collaborative approach with existing providers of similar services.

The Applicant considered various alternatives to the proposed project including:

- **Alternatives to the proposed site within the town of Bristol: The site for the proposed program must meet several requirements for zoning, parking, ease of access and structural support for a linac machine. The Applicant initially identified several sites**

and conducted engineering and architectural analyses to determine their appropriateness. Three feasible sites were identified negotiations commenced to at each to establish the proposed facility. The Applicant concluded on the basis of these discussions that the proposed site would be most cost-effective.

- **While the Applicant will provide transportation assistance to patients when needed, it did not consider the possibility of transporting patients to other area facilities as a viable alternative to establishing the proposed facility. The Applicant believes that such an approach would not result in the provision of needed capacity and would not help to relieve the suffering of patients who experience difficulties with travel to and from therapy.**
- **The Applicant intends to establish a series of collaborations throughout the service area to ensure proper continuity of care and coordination among care givers. The Applicant knows of no method of collaboration that would result in the addition of the necessary capacity and improvement in access that is represented by the present proposal.**

The Applicant believes that services must be provided within the area in order for patients to fully benefit from this therapy. While the applicant considered alternative locations for the service, the proposed location was identified as the most appropriate and cost effective.

H. Please provide a justification for the instant proposal and the scope thereof as opposed to the alternative proposals identified in (G) above.

Cancer is the second leading cause of death in the United States. As noted above, the incidence of cancer in Rhode Island is even higher than that of the nation as a whole. According to the 2007 Rhode Island Comprehensive Cancer Control Plan, the cancer burden among state residents is enormous:

> **"Cancer is the second leading cause of death in Rhode Island. About four out of every 10 people in Rhode Island will develop cancer sometime in the course of their lives, and half of them will die of the disease. At any one time, it is estimated that over 33,000 Rhode Islanders are living with cancer or are cancer survivors. We have all been personally affected by someone who has struggled or is struggling with the physical, emotional, and financial challenges of this disease. In 2007, an estimated 6,360 new cancer cases will be diagnosed, and an estimated 2,370 Rhode Islanders will die of the disease."**
>
> **- RI Comprehensive Cancer Control Plan**

Given this burden, efforts to combat cancer must be direct and effective. They must also be comprehensive. As the state's cancer plan reflects, the effort to control cancer must be undertaken at many levels including prevention, early detection, treatment and improved access to services. The Applicant's proposal is the best alternative for achieving this type of effort.

Radiation therapy is a primary element in the approach to cancer treatment. It is a well proven and effective treatment for the majority of persons with cancer. Effective access to high quality radiation therapy services is essential in any present day approach to cancer treatment. As an element of therapy for most cancer patients, radiation treatment provides a focal point for communication and collaboration among the full range of providers involved with cancer treatment. It also provides an opportunity for the education of families and outreach into the community.

The purpose of the proposed program is to ensure this access for Rhode Islanders and to do so in a manner that supports broader efforts (such as prevention and early detection) to address the burden of this disease.

The approval of this program is superior to all other alternatives for the following reasons:

A. **Available radiation therapy services in Rhode Island are at or are approaching working capacity. Given projected growth in the need for these services this situation must be relieved or avoided in order to maintain an effective treatment system. The proposed project represents the only alternative that accomplishes such an increase.**

B. **While pockets of capacity may exist in various locations elsewhere in the state, their use by residents of the service area would require extended travel time. As noted in The CyberKnife Report and discussed in Tab 1, increases in travel undermine the delivery of these services. While special transportation systems as considered above are conceivable, they would not eliminate the burden of travel. The proposed project is the only alternative that would minimize travel for patients residing in a large region of the state.**

C. **The proposed project addresses the goals of the RI Cancer Control Plan. In a broad manner. That is, in addition to addressing the goal of increased access to care, the proposed service will serve as a vehicle for education, prevention and early detection efforts in the communities it serves. The processes and tools used by the proposed program will ensure coordination of care and will foster collaboration among area providers. This proposal is the only alternative for addressing cancer in the area that comprehensively addresses the various types of efforts needed to combat the burden of cancer.**

In summary, The Applicant's proposal poses a direct, comprehensive and concrete effort to address the burden of Cancer in the area it serves. Approval of this program will ensure and improve access to care while helping to generate a broader, collaborative effort to diminish the impact of cancer in the Bristol area.

HEALTH DISPARITIES AND CHARITY CARE

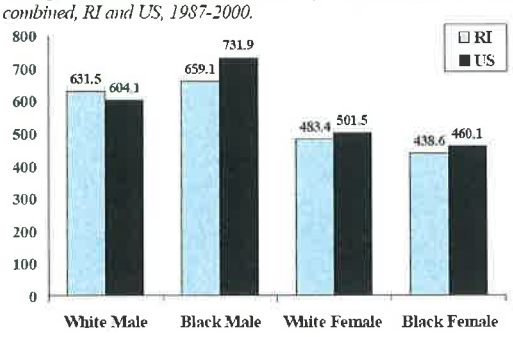
8.) The RI Department of Health defines health disparities as inequalities in health status, disease incidence, disease prevalence, morbidity, or mortality rates between populations as impacted by access to services, quality of services, and environmental triggers. Disparately affected populations may be described by race & ethnicity, age, disability status, level of education, gender, geographic location, income, or sexual orientation.

A. Please describe all health disparities in the applicant's service area. Provide all appropriate documentation to substantiate your response including any assessments and data that describe the health disparities.

The Rhode Island Comprehensive Cancer Control Plan identifies and targets a wide range of disparities in the distribution of the cancer burden across the population. Disparities are identified in cancer incidence and prevalence for socioeconomic groups and ethnic groups and special populations. The following charts excerpted from the plan illustrate the range and significance of these:

Figure 8. Cancer incidence by race and sex for all cancers combined

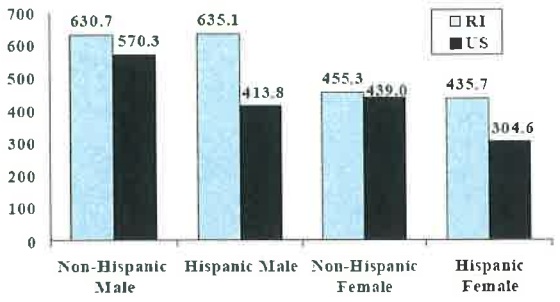
Average annual cancer incidence rates by race and sex for all cancers combined, RI and US, 1987-2000.*



* Rates are age-adjusted to the year 2000 US standard population, expressed as cases per 100,000 population.Source: RICR. HEALTH: SEER Public-Use 1973-2000 Data: calculated with *SEER*Stat*.

Figure 12. Cancer incidence by ethnicity and gender for all cancers combined

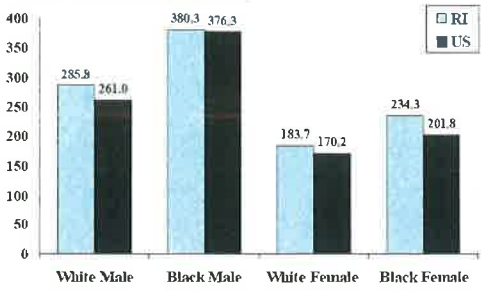
Average annual cancer incidence rates by race and gender for all cancers combined, RI and US, 1999-2003.*



* Rates are age-adjusted to the year 2000 US standard population, expressed as cases per 100,000 population.Source: RICR. HEALTH: SEER Public-Use 1973-2003 Data: calculated with *SEER*Stat*.

Figure 9. Cancer mortality by race and sex for all cancers combined

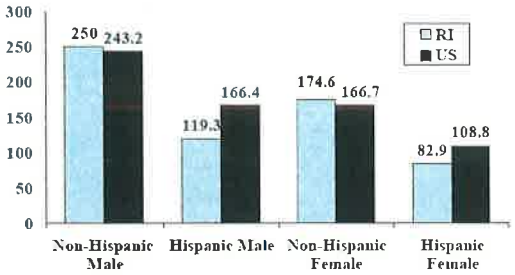
Average annual cancer mortality rates by race and sex for all cancers combined, RI and US, 1987-2000*



* Rates are age adjusted to the year 2000 US standard population, expressed as deaths per 100,000 population.
Source: Office of Vital Records. HEALTH: SEER US Mortality 1969-2000
Data: calculated with *SEER*Stat*.

Figure 13. Cancer mortality by ethnicity and gender for all cancers combined

Average annual cancer mortality rates by race and gender for all cancers combined, RI and US, 1999-2003*



* Rates are age adjusted to the year 2000 US standard population, expressed as deaths per 100,000 population.
Source: Office of Vital Records. HEALTH: SEER US Mortality 1969-2003
Data: calculated with *SEER*Stat*.

While disparities arise from a multiplicity of causes, at least one theme appears common: namely poverty and financial resources. According to the plan:

> **"Access to quality healthcare is most closely linked to socio-economic status, which includes level of income and education. Compared to people with health insurance coverage, those without health insurance have more difficulty accessing personal health services such as cancer screenings, use less medical services, and receive less outpatient and inpatient care. They often seek care at a later or more advanced stage of disease, leading to higher death rates. Lack of access to a regular source of healthcare including screening tests, early detection, and preventive health messages all contribute to these disparities."**

B. Discuss the impact of the proposal on reducing and/or eliminating health disparities in the applicant's service area.

The Applicant will take certain key steps to address disparities in cancer care. These include the efforts to diminish financial barriers by providing free care to those who require it. Based on a case-by-case assessment, patients will be eligible for other types of assistance as well, such as help with transportation, home care and similar services that can be subsidized through the Applicant's charitable foundation.

Cultural barriers will also be addressed, including translation services when necessary and efforts to make patients from other cultures feel welcomed, at home and understood while undertaking therapy.

9.) Please provide a copy of the applicant's charity care policies and procedures and charity care application form. **See Tab 3.**

We do not have a charity care application that is provided directly to our patients. Each patient meets individually with our financial counselor. The counselor reviews the documentation provided by the patient per our policy and uses the worksheet at Tab 3 to determine if the patient qualifies for a charity care discount. Charity care is available to patients that have a balance greater than $1000. If the balance is less than $1000, the patient is responsible for the full amount. "Credit availability" is defined as having enough open credit available to cover the outstanding balance with our facility. This is obtained through a TransUnion credit check, a "soft hit" to the patient's credit. Retail store credit cards are not counted towards available credit.

This policy is identical to the charity care policies at all other facilities owned by our parent, including the Rhode Island owned facilities. The table below shows up to what percent of the Federal Poverty Level would allow a patient to qualify for charity care services.

LEGEND		100% Discount (up to 200% of poverty guidelines)	50% Discount (between 200-300% of poverty guidelines)	No Discount (over 300% of poverty guidelines)
Family Size				
1		$ 22,340.00	$ 33,510.00	$ 33,510.01
2		$ 30,260.00	$ 45,390.00	$ 45,390.01
3		$ 38,180.00	$ 57,270.00	$ 57,270.01
4		$ 46,100.00	$ 69,150.00	$ 69,150.01
5		$ 54,020.00	$ 81,030.00	$ 81,030.01
6		$ 61,940.00	$ 92,910.00	$ 92,910.01

FINANCIAL ANALYSIS

10.) A) Please itemize the capital costs of this proposal. Present all amounts in thousands (e.g., $112,527=$113). If the proposal is going to be implemented in phases, identify capital costs by each phase.

CAPITAL EXPENDITURES		
	Amount	**Percent of Total**
Survey/Studies	$10	0.19%
Fees/Permits	$15	0.29%
Architect	$50	0.96%
"Soft" Construction Costs	$75	1.43%
Site Preparation	$	%
Demolition	$	%
Renovation	$	%
New Construction	$1,180	22.56%
Contingency	$ 100	1.91%
"Hard" Construction Costs	$1,280	24.47%
Furnishings	$	%
Movable Equipment	$	%
Fixed Equipment	$3,775	72.18%
"Equipment" Costs	$3,775	72.18%
Capitalized Interest	$	%
Bond Costs/Insurance	$	%
Debt Services Reserve[1]	$	%
Accounting/Legal	$100	1.91%
Financing Fees	$	%
"Financing" Costs	$	%
Land	$	%
Other (specify _____)	$	%
"Other" Costs	$	%
TOTAL CAPITAL COSTS	**$5,230**	**100%**

[1] Should not exceed the first full year's annual debt payment.

B.) Please provide a detailed description of how the contingency cost in (A) above was determined.

The contingency cost was determined based upon the prior experience of New England Radiation Therapy Management Services, Inc., the sole member of the Applicant, in constructing radiation oncology facilities throughout the country to address unforeseen expenses due to conditions of the site and availability of building materials.

C.) Given the above projection of the total capital expenditure of the proposal, please provide an analysis of this proposed cost. This analysis must address the following considerations:

i. The financial plan for acquiring the necessary funds for all capital and operating expenses and income associated with the full implementation of this proposal, for the period of 6 months prior to, during and for three (3) years after this proposal is fully implemented, assuming approval.

The Applicant is an affiliate of RTSI, which will provide all necessary capital and operating funds necessary. RTSI has a $140M revolving line of credit and will utilize this to provide the equity funds needed for this proposal.

ii. The relationship of the cost of this proposal to the total value of your facility's physical plant, equipment and health care services for capital and operating costs.

This is a new facility, so the proposed costs represent 100% of the facility's value.

iii. A forecast for inflation of the estimated total capital cost of the proposal for the time period between initial submission of the application and full implementation of the proposal, assuming approval, including an assessment of how such inflation would impact the implementation of this proposal.

The capital costs include inflation and, therefore, will have no impact on implementation.

11.) Please indicate the financing mix for the capital cost of this proposal. **NOTE:** the Health Services Council's policy requires a minimum 20% equity investment in CON projects (33% equity minimum for equipment-related proposals).

Source	Amount	Percent	Interest Rate	Terms (Yrs.)	List source(s) of funds (and amount if multiple sources)
Equity*	**$2,700,750**	**51.6%**	**N/A**	**N/A**	**Radiation Therapy Services, Inc., 2270 Colonial Boulevard, Fort Myers, Florida - $140M revolving line of credit**
Debt**	**$0**	**0.0%**	**%**		
Lease**	$2,529,250	48.4%	9.00%	5	3rd party financing company – to be determined.
TOTAL	**$5,230,000**	**100%**			

* Equity means non-debt funds contributed towards the capital cost of an acquisition or project which are free and clear of any repayment obligation or liens against assets, and that result in a like reduction in the portion of the capital cost that is required to be financed or mortgaged (R23-15-CON).

** If debt and/or lease financing is indicated, please complete **Appendix F**.

12.) Will a fundraising drive be conducted to help finance this approval? Yes____ No **X**

13.) Has a feasibility study been conducted of fundraising potential? Yes___ No **X**

- If the response to Question 13 is 'Yes', please provide a copy of the feasibility study.

14.) Will the applicant apply for state and/or federal capital funding? Yes___ No **X**

- If the response to Question 14 is 'Yes', please provide the source: _____, amount: _____, and the expected date of receipt of those monies: _____.

15.) Please calculate the yearly amount of depreciation and amortization to be expensed.

Depreciation/Amortization Schedule - Straight Line Method					
		Equipment			
	Improvements	**Fixed**	**Movable**	**Amortization**	**Total**
Total Cost *1*	$1,280	$3,775	$	$	$5,055
(-) Salvage Value	$0	$0	$	$	$0
(=) Amount Expensed	$1,280	$3,775	$	$	$3,775
(/) Average Life (Yrs.)	15	10			mixed
(=) Annual Depreciation *2*	**$85**	**$378**	**$**	**$**	**$463**

1 Must equal the total capital cost (Question 10 above) less the cost of land and less the cost of any assets to be acquired through lease financing

2 Must equal the incremental "depreciation/amortization" expense, column -5-, in Question 18 (below).

16.) For the first full operating year of the proposal (identified in Question 18 below), please identify the total number of FTEs (full time equivalents) and the associated payroll expense (including fringe benefits) required to staff this proposal. Please follow all instructions and present the payroll in thousands (e.g., $42,575=$43).

	Existing		Additions/(Reductions)		New Totals	
Personnel	**# of FTEs**	**Payroll W/Fringes**	**# of FTEs**	**Payroll W/Fringes**	**# of FTEs**	**Payroll W/Fringes**
Medical Director	N/A	$N/A	0.25	$60,000	0.25	$60,000
Physicians	N/A	$ N/A	1.00	$628,217	1.00	$628,217
RT	N/A	$ N/A	2.00	$168,000	2	$168,000
Dosimetry	N/A	$N/A	0.75	$135,000	0.75	$135,000
Physicist	N/A	$N/A	0.75	$180,000	0.75	$180,000
Administrator		$N/A	0.50	$40,000	0.5	$40,000
RNs	N/A	$N/A	1.00	$72,000	1.0	$72,000
LPNs		$		$		$
Nursing Aides		$		$		$
PTs		$		$		$
OTs		$		$		$
Speech Therapists		$		$		$
Clerical (Front Desk)	N/A	$N/A	1.00	$36,000	1.0	$36,000
Housekeeping		$		$		$
Other: (specify) Office Financial Manager	N/A	$N/A	1.00	$48,000	1.0	$48,000
TOTAL *1*	**N/A**	**$N/A**	**8.25**	**$1,367,217**	**8.25**	**$1,367,217**

1 Must equal the incremental "payroll w/fringes" expense in column -5-, Question 18 (below).

INSTRUCTIONS:

"FTEs" Full time equivalents, are the equivalent of one employee working full time (i.e., 2,080 hours per year)

"Additions" are NEW hires;

"Reductions" are staffing economies achieved through attrition, layoffs, etc. It does **NOT** report the reallocation of personnel to other departments.

17.) Please describe the plan for the recruitment and training of personnel.

The plan is to recruit qualified candidates with the appropriate educational and clinical experience commensurate with the unique aspects of this specialized service. Staff will possess the required licenses and/or certifications that are required. The Applicant will have access to the expertise and training programs provided by RTSI.

18.) Please complete the following pro-forma income statement for each unit of service. Present all dollar amounts in thousands (e.g., $112,527=$113). Be certain that the information is accurate and supported by other tables in this worksheet (i.e., "depreciation" from Question 15 above, "payroll" from Question 16 above). If this proposal involved more than two separate "units of service" (e.g., pt. days, CT scans, outpatient visits, etc.), insert additional units as required.

PRO-FORMA P&L STATEMENT FOR WHOLE FACILITY					
	Actual Previous Year 20__ (1) N/A	Budgeted Current Year 20__ (2) N/A	<-- FIRST FULL OPERATING YEAR 2015 -->		
			CON Denied (3)	CON Approved (4)	Incremental Difference *1* (5)
REVENUES:					
Net Patient Revenue *2*	$	$	$0	$ 3,561	$ 3,561
Other:	$0	$	$0	$0	$0
Total Revenue	$	$	**$0**	**$ 3,561**	**$ 3,561**
EXPENSES:	$	$	$	$	$
Payroll w/Fringes *3*	$	$	$0	$1,367	$ 1,367
Bad Debt *4*	$	$	$0	$ 71	$ 71
Supplies	$	$	$0	$ 35	$ 35
Office Expenses	$	$	$0	$ 25	$ 25
Utilities	$	$	$0	$ 50	$ 50
Insurance	$	$	$0	$ 60	$ 60
Interest *5*	$	$	$0	$ 201	$ 201
Depreciation/Amortization	$	$	$0	$ 463	$ 463 *6*
Leasehold Expenses	$	$	$0	$ 600	$ 600
Other: Corporate Overhead	$	$	$0	$ 90	$ 90
Total Expenses *7*	$	$	**$0**	**$2,962**	**$ 2,962**
OPERATING PROFIT:	$	$	**$0**	**$ 599**	**$ 599**

For each service to be affected by this proposal, please identify each service and provide: the utilization, average net revenue per unit of services and the average expense per unit of service.

Service Type: Patient Treatments	**Radiation Therapy**				
Service (#s): 3971					
Net Revenue Per Unit *8*	$896.75	$	$	$	$
Expense Per Unit	$745.91	$	$	$	$
Service Type:					
Service (#s):					
Net Revenue Per Unit *8*	$	$	$	$	$
Expense Per Unit	$	$	$	$	$

INSTRUCTIONS: Present all dollar amounts (except unit revenue and expense) in thousands.

1 The Incremental Difference (column -5-) represents the actual revenue and expenses associated with this CON. It does not include any already incurred allocated or overhead expenses. It is column -4- less column –3-.
2 Net Patient Revenue (column -5-) equals the different units of service times their respective unit reimbursement.
3 Payroll with fringe benefits (column -5-) equals that identified in Question 16 above.
4 Bad Debt is the same as that identified in column -4-.
5 Interest Expense equals the first full year's interest paid on debt.
6 Depreciation equals a full year's depreciation (Question 15 above), not the half year booked in the year of purchase.
7 Total Expense (column -5-) equals the operating expense of this proposal and is defined as the sum of the different units of service;
8 Net Revenue per unit (of service) is the actual average net reimbursement received from providing each unit of service; it is NOT the charge for that service.

19.) Please provide an analysis and description of the impact of the proposed new institutional health service or new health equipment, if approved, on the charges and anticipated reimbursements in any and all affected areas of the facility. Include in this analysis consideration of such impacts on individual units of service and on an aggregate basis by individual class of payer. Such description should include, at a minimum, the projected charge and reimbursement information requested above for the first full year after implementation, by payor source, and shall present alternate projections assuming (a) the proposal is not approved, and (b) the proposal is approved. If no additional (incremental) utilization is projected, please indicate this and complete this table reflecting the total utilization of the facility in the first full fiscal year.

Projected First Full Operating Year: FY 2015									
	Implemented			Not Implemented			Difference		
Payor Mix	Projected Utilization		Total Revenue	Projected Utilization		Total Revenue	Projected Utilization		Total Revenue
	#	%	$	#	%	$	#	%	$
Medicare	1330	33.5%	1,118,830	0	0	0	1330	33.5%	1,118,830
RI Medicaid	119	3.0%	61,294	0	0	0	119	3.0%	61,294
Non-RI Medicaid	40	1.0%	20,459	0	0	0	40	1.0%	20,459
RIte Care	0	0%	0	0	0	0	0	0%	0
Blue Cross	913	23.0%	927,824	0	0	0	913	23.0%	927,824
Commercial	1072	27.0%	1,089,185	0	0	0	1072	27.0%	1,089,185
HMO's	397	10.0%	309,587	0	0	0	397	10.0%	309,587
Self Pay	40	1.0%	33,821	0	0	0	40	1.0%	33,821
Charity Care	60	1.5%	0	0	0	0	60	1.5%	0
Other: _____									
TOTAL	3971	100%	3,561,000				3971	100%	3,561,000

20.) Please provide the following:

A. Please provide audited financial statements for the most recent year available.

See Tab 4.

B. Please discuss the impact of approval or denial of the proposal on the future viability of the (1) applicant and (2) providers of health services to a significant proportion of the population served or proposed to be served by the applicant.

Approval of the Application will allow RTSI to optimize its statewide network of services with an effective utilization of economies of scale to provide quality cost-effective services to the underserved area in the East Bay region.

The approval of this proposal will allow the citizens of our state who reside in the East Bay for the first time to have access to state-of-the-art cancer care in their own community, with comfort and support of family and friends.

Through the presence of this facility in the East Bay, primary care physicians and other local practitioners will become more attuned to cancer screening and surveillance technologies, will experience first-hand the benefits of early diagnosis and multimodality, minimally invasive treatments on their own patients while actively participating in the continuum of care vs. episodic care of these same patients.

The community will be better educated in the screening, early detection and treatment of cancers and ultimately will have a lesser incidence of cancer.

If they do develop cancer, it is highly likely that through our community sponsored education and knowledge gained, they will present with a less severe, less acute stage of illness which is more amenable to treatment with cost effective radiation vs. more advanced and disseminated cancers that may require more costly surgery and chemotherapy protocols in addition to radiation.

If this proposal is not approved then the East Bay cancer care paradigm will remain status quo:
East Bay will continue to be an underserved portion of our state for 1) cancer screening 2) surveillance 3) technology 4) access to state of the art oncology care and patients will continue to present with advanced vs. less advanced disease. These same patients will continue to have an increased mortality and morbidity rate, at a high financial and resource burden to the RI Healthcare system.

21.) Please identify the derivable operating efficiencies, if any, (i.e., economies of scale or substitution of capital for personnel) which may result in lower total or unit costs as a result of this proposal.

The proposed project will be efficiently developed and operated, providing a much needed service in a cost-efficient manner. Moreover, it will contribute to longer term efforts to improve care and control health care costs, that is, by making this radiation therapy more accessible to residents of the service area. The project will foster patient compliance and more effective therapy and will reduce downstream costs associated with failed treatment. There are no specific derivable operating efficiencies which may result in lower total or unit costs as a result of this proposal.

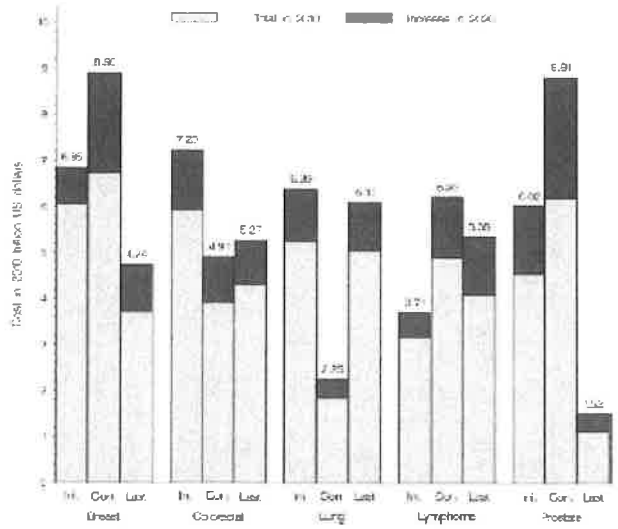
22.) Please describe on a separate sheet of paper all energy considerations incorporated in this proposal.

The proposed building will be designed with green technology to maximize energy efficiencies including, without limitation, energy efficient lighting and HVAC, proper amount of insulation in the building envelope and moisture control. While this technology will meet the LEED certification criteria, it may be cost prohibitive for the Application to apply for the actual certification.

23.) Please comment on the affordability of the proposal, specifically addressing the relative ability of the people of the state to pay for or incur the cost of the proposal, at the time, place and under the circumstances proposed. Additionally, please include in your discussion the consideration of the state's economy.

Apart from the suffering and costs of cancer for patients, its economic burden to our society at large is extraordinary. This burden is so great that it is continually monitored by the National Cancer Institute, which regularly publishes data for the cost of individual types of cancer and for the disease group as a whole.

The following graph and key are reproduced from the most recent summary and projection of the cost of cancer to the nation. The graph demonstrates the rapidly increasing economic burden of this disease.



Estimates of the national expenditures for cancer care in 2010 (**light gray areas**) and the estimated increase in cost in 2020 (**dark gray areas**) because of the aging and growth of the US population under assumptions of constant incidence survival and cost for the major cancer sites. Costs in 2010 billion US dollars by phase of care: initial year after diagnosis (Ini.) continuing care (Con.) and last year of life (Last).

J Natl Cancer Inst. 2011 Jan 19;103(2):117-28. Epub 2011 Jan 12.
Projections of the cost of cancer care in the United States: 2010-2020.

This report provides sobering conclusions about the rising cost of the cancers identified in the graph and all other types of cancer as well. It finds that the national total cost of cancer is estimated at $124.57 billion in 2010 and expected to increase by 20% to almost $158 billion by 2020. This very roughly equates to costs of over ½ billion dollars a year for the State of Rhode Island.

The proposed project will improve access and quality for a substantial segment of the state's population. While the reduction of the cancer burden requires a broad range of health care initiatives, better and more accessible treatment is obviously one key element among these. Given the enormous personal suffering and societal cost of this disease, we cannot afford to pass up any effective opportunity to address it.

This proposal is affordable, as it is paid for in its entirety with the funds of privately held for-profit companies with deep roots and 12 year successful operating experience in the State of Rhode Island.

These companies and this facility will generate and pay property, sales and employment taxes, create jobs, and provide free care to any patient in need. This facility will also pay an OACF Facility Tax equal to 2% of gross revenues.

Since this is a cancer care treatment vs. diagnostic facility, only those patients who have biopsy proven cancer will be treated in this facility. These patients will require treatment with radiation and this will occur at a facility distant to most patients in the service area. Our

facility will offer them treatment closer to home and in close proximity to their primary care providers, where many of their medical records are stored.
As such, the State is not paying for the proposal or burdened by the cost of the needed radiation therapy services which are the subject of this proposal.

The facility's developers, owners, and operators are making a personal investment in the healthcare infrastructure of the State of Rhode Island, for the benefit of those residents of the East Bay who do not have standard of care access to state of the art cancer care.

From a pure financial perspective, this facility being built in Bristol will relieve the necessity of patients from East Bay in need of radiation therapy traveling to St. Anne's and the Southcoast Health System facilities in Fall River, where the payment rate for cancer services is approximately 17% higher than the same services provided in RI.

Therefore, our Rhode Island UHP and BC/BS insurers will experience cost savings as a result of East Bay patients remaining in RI for cancer care. Rhode Island patients and their health care dollars will stay in RI and contribute to our Rhode Island economy vs. contributing to the Massachusetts economy at our expense.

In the consideration of the State's economy we are fortunate that 21ST Century Oncology has infused over $40 million in capital expense in Rhode Island for the clinical benefit of Rhode Islanders since 2002, and are now ready to infuse an additional $5 million for technology, that will create 8 new jobs at an annual payroll of approximately $1.3 million and will create $6 million of economic opportunity for construction materials and trade union jobs.

As such, this proposal is accretive to the State's finances, does not cause an incremental increase to the cost of cancer care for our health care insurers or an increase in health insurance premiums for our employers.

QUALITY, CONTINUITY OF CARE, AND RELATIONSHIP TO THE HEALTH CARE SYSTEM

24.) **A) If the applicant is an existing facility:**

Please identify and describe any outstanding cited health care facility licensure or certification deficiencies, citations or accreditation problems as may have been cited by appropriate authority. Please describe when and in what manner this licensure deficiency, citation or accreditation problem will be corrected. **N/A**

B) If the applicant is a proposed new health care facility:

Please describe the quality assurance programs and/or activities which will relate to this proposal including both inter and intra-facility programs and/or activities and patient health outcomes analysis whether mandated by state or federal government or voluntarily assumed. In the absence of such programs and/or activities, please provide a full explanation of the reasons for such absence.

21st Century Oncology requires all field offices to participate in quality assurance programs on multiple levels:

- **It follows the recommendations of the American Association of Physicists in Medicine task group reports "TG-106: Accelerator beam data commissioning" and "TG-142: Quality assurance of medical accelerators", copies attached. TG-142 outlines the daily, monthly, and annual QA for all components of the linear accelerator, including imaging, in tables I – V of the report. See Tab 5.**

- **All of its Rhode Island centers are accredited by ACRO (American College of Radiation Oncology). From the ACRO website: "Accreditation is a voluntary process in which professional peers identify standards indicative of a quality practice, and an audit is conducted to assure that these standards are followed." 21ST Century plans to pursue the same accreditation in the new facility.**

- **All staff is trained and follows the standards laid out in our Total Quality Management manual, the table of contents of which is attached here. This manual explains proper protocols for a variety of tasks that are performed daily in the department. The quality assurance program includes hundreds of pages. Please see the Table of Contents, Radiation Therapist Code of Ethics and Purpose of TQM Manual, at Tab 5. The entire program, or portions thereof, is available for review, as may be requested.**

- **Before each patient starts, all treatment plans are double checked by physics. All IMRT plans have a separate QA plan that is run on the machine in the absence of the patient. All doses are monitored to verify that that the calculated treatment plan is identical to the treatment plan that has been transferred to the LINAC. This process also verifies every treatment field and segment is correct.**

- **Each treatment is delivered to the patient using image-guided technology to ensure that the dosage is being delivered to the correct area of the body.**

- **Our physics staff has developed an algorithm, known as the "gamma function", to monitor the exit dose of every field during every treatment to monitor and evaluate any deviations from the plan.**

- **Twice a year, each physician is subject to a retrospective chart review by a senior physician in the company to ensure their plans meet quality standards.**

- **All staff, including the physicians, participates in weekly "chart rounds", where all patient information and treatment plans are reviewed.**

- **Physicians meet with all of their patients once a week to monitor and document any side effects of radiation treatment.**

C) If this proposal involves construction or renovation:

Please describe your facility's plan for any temporary move of a facility or service necessitated by the proposed construction or renovation. Please describe your plans for ensuring, to the extent possible, continuation of services while the construction and renovation take place. Please include in this description your facility's plan for ensuring that patients will be protected from the noise, dust, etc. of construction. **N/A**

25.) Please discuss the impact of the proposal on the community to be served and the people of the neighborhoods close to the health care facility who are impacted by the proposal.

The proposed facility will be located in a state-of-the-art facility, to be constructed by a third party in an area zoned for commercial occupancy. All work will be done within the confines of the property and no impact on the residential neighborhood is anticipated.

26.) Please discuss the impact of the proposal on service linkages with other health care facilities/providers and on achieving continuity of patient care.

Radiation Therapy is one element in a broader and complex treatment process for virtually all patients. It cannot be effectively provided without effective linkages to a wide range of providers including PCP's, specialists and institutional providers.

Given this need, the Applicant will focus its efforts on serving the residents of its primary service area. This approach will allow the Applicant the best opportunity to provide these services in a manner that is well integrated into a broader health system and employs linkages and collaborations with other providers operating in that same system. Given this emphasis, the proposed program will establish very strong linkages with area providers and generally strengthen collaboration across the system.

27.) Please address the following:

A. How the applicant will ensure full and open communication with their patients' primary care providers for the purposes of coordination of care;

Radiation therapy patients are not typically referred for treatment by their primary care providers. However, staff obtains the name of each patient's primary care physician during the initial visit to the office. Any medical records that are relevant to the patient's cancer diagnosis from all physicians involved in their care, including primary care are obtained. While the Applicant does not have two-way electronic access to medical records kept by the patient's primary care/specialty physicians, it takes great care to keep its records up to date by making regular calls to all of the relevant physician offices. In addition, all physicians involved in the care of one of its patients automatically receive a faxed copy of any notes or dictations that are generated by our radiation oncologists so that they can keep their own records current.

The facility oncology Nurse Navigator will be responsible for the very important patient –centric function of coordinating and reporting the care of all patients undergoing radiation therapy to all of the members of patient's care team, including friends and family, spiritual care providers, primary care physicians, social workers, pharmacists and those physicians and facilities that may be providing adjunct chemo, therapeutic, or surgical care to the patient.

B. Discuss the extent to which preventive services delivered in a primary care setting could prevent overuse of the proposed facility, medical equipment, or service and identify all such preventative services;

Cancer prevention and primary care are obviously critical elements in the effort to reduce the cancer burden in this country. As demonstrated in response to question 23 above, dramatic reduction in the incidence of cancer is not forecast in the foreseeable future. Hopefully the need for treatment will be reduced in the future but is not expected soon.

First, it is of utmost importance to understand that this is not a facility in which cancer is diagnosed. It is, however, a facility in which cancer is staged and treated. In order to be treated through the use of radiation therapy the patient MUST have biopsy proven cancer of a type that is amenable to curative or palliative therapy through the use of radiation. That being said, it is virtually impossible to overuse the technology in this facility. Through education of the primary care physicians, specialty physicians and members of the community regarding the features, advantages and benefits of the use of proper screening techniques for lung cancer, prostate cancer, colon cancer and oral maxillofacial cancer, we hope to be able to diagnose cancers at the earliest stage of their development, treat them with the most minimally invasive surgery and adjunct therapies and cure them of their illness.

C. Describe how the applicant will make investments, parallel to the proposal, to expand supportive primary care in the applicant's service area.

The primary contribution to primary care to be made by the proposed service is, as described above, the provision of a strong mechanism to promote consultation and collaboration among all physicians involved in the treatment of cancer. Through the sponsorship of local continuing medical education seminars regarding cancer screening, surveillance, local tumor boards, and the work of our oncology Nurse Navigator, the primary care practitioner will have an integral role in the patient's continuum of care from screening through treatment and end-of-life care if it becomes necessary. We do note the role of the primary care physician not as a "referring physician," but rather as a physician participating in the patient's entire continuum of care. If we discover that further primary care is necessary in the service area, we are prepared to invest the money needed to support primary care programs.

D. Describe how the applicant will use capitalization, collaboration and partnerships with community health centers and private primary care practices to reduce inappropriate Emergency Room use.

The Applicant will contribute to reduction in unnecessary emergency room use by providing its services in a high quality manner, maintaining active communication with other providers and minimizing the side effects of treatment to prevent unnecessary trips to the Emergency Room. Through the use of our capital resources we will create and support local continuing medical education, local tumor boards, and the efforts of our oncology Nurse Navigator so that the primary care physicians will become better acquainted with the routine side effects of oncology surgery, chemotherapy infusion, and radiation therapy, both as sole and adjunct therapies. They will be kept aware of the cycle of treatment of each stage of cancer care that their patient is undergoing, and will be referred to their primary care physician by our facility for treatment of those side effects or exacerbations of illness. The patient's primary care physicians and their offices will be utilized as the primary site for patients to utilize to treat the side effects of cancer care. Close frequent communication among the patient's medical and surgical professionals led by our oncology Nurse Navigator will assure that complications will be noticed early, dealt with swiftly, and, in most cases, prevented from being escalated to a state of acuity whereby ER use would be necessary to treat symptoms support or preserve life.

E. Identify unmet primary care needs in your service area, including "health professionals shortages", if any (information available at Office of Primary Care and Rural Health at http://www.health.ri.gov/disease/primarycare/hpsa-professionals.php).

Primary care services are generally underdeveloped outside the most urbanized portions of the service area. There can never be enough primary care physicians to support the well care or sick care of a community, let alone add to that burden by having the added responsibility to care for the side effects of patient care provided by subspecialty professionals. As stated above, if the need is determined to exist for primary care physicians to be hired in our patient service demographic we have the resources to recruit and hire primary care physicians to fill the void in the community.

28.) Please discuss the relationship of the services proposed to be provided to the existing health care system of the state.

The proposed services address major priorities of the health system by improving access to care for one of the foremost health problems in the state and ensuring that the provision of these services are well integrated with those of other providers that provide other types of cancer care.

It is the standard of care for a patient to not have to travel greater than 20 to 30 minutes in either direction in order to receive radiation therapy treatment. Since not all cancer patients drive or can drive while undergoing treatment and public transportation in Bristol is non-frequent and unreliable, patients do not have routine community access to cancer care technologies generally available in all other communities in the State of Rhode Island. As a result of this facility being present in Bristol, RI, patients will for the first time have state-of-the-art, reliable cancer care available in their home community. Cancer care is daunting by itself without having to add to the already heavy burden of the patients and their families by having to find transportation for 45 daily radiation therapy treatments.

The presence of this state-of-the-art facility and its methodology of integrated care for cancer patients will afford the opportunity for the patient's primary care physician to actively participate in the continuum of their patients care vs. providing episodic care.

This process will keep patients in their community, provide economic reward to the local primary care physician base, keep patients healthier for longer periods of time, in part by reducing travel costs, eliminating unnecessary ER visits and associated costs, and ultimately helping to eliminate expensive per capita cost of episodic care delivery.

Select and complete the Appendixes applicable to this application:

Appendix	Check off:	Required for:
A		Accelerated review applications
B		Applications involving provision of services to inpatients
C		Nursing Home applications
D	√	**All applications**
E	√	Applications with healthcare equipment costs in excess of $1,000,000 and any tertiary/specialty care equipment
F	√	Applications with debt or lease financing
G	√	**All applications**

612885.1

Appendix D

All applications must be accompanied by responses to the questions posed herein.

1. Provide a description and schematic drawing of the contemplated construction or renovation or new use of an existing structure and complete the Change in Space Form.

The Applicant will lease premises in a building to be constructed by a third party. The Applicant will provide blueprints of the proposed premises reviewed by a licensed architect and certified for compliance with the applicable construction requirements to the Department of Health prior to construction. Specifically, the proposed building will be a 9,000 SF single-story, medical office building with a provision to add a 2nd floor in the future to house private physician offices. Initially, the building will be housing East Bay Comprehensive Cancer Center. The Cancer Center's layout has been designed to provide easy flow for patients and staff, as well as providing privacy and comfort. Please see the attached schematic floor plan at Tab D1.

2. Please provide a letter stating that a preliminary review by a Licensed architect indicates that the proposal is in full compliance with the current edition of the "Guidelines for Design and Construction of Hospital and Health Care Facilities" and identify the sections of the guidelines used for review. Please include the name of the consulting architect, and their RI Registration (license) number and RI Certification of Authorization number.

n/e/m/d architects, inc., 95 Sockanosset Cross Road, Suite 203, Cranston, RI 02920, is the architect for the project. See attached letter at Tab D2.

3. Provide assurance and/or evidence of compliance with all applicable federal, state and municipal fire, safety, use, occupancy, and other health facility licensure requirements.

The facility will meet applicable federal, state and municipal fire, safety, use, occupancy and other health facility licensure requirements.

4. Does the construction, renovation or use of space described herein corrects any fire and life safety, Joint Commission on Accreditation of Healthcare Organizations (JCAHO), U.S. Department of Health and Human Services (DHHS) or other code compliance problems: Yes____ No _X_

- If Yes, include specific reference to the code(s). For each code deficiency, provide a complete description of the deficiency and the corrective action being proposed, including considerations of alternatives such as seeking waivers, variances or equivalencies.

5. Describe all the alternatives to construction or renovation which were considered in planning this proposal and explain why these alternatives were rejected.

Due to the unique requirements of radiation safety controls to operate a linear accelerator, there are no viable alternatives to construction or renovation in the East Bay area.

6. Attach evidence of site control, a fee simple, or such other estate or interest in the site including necessary easements and rights of way sufficient to assure use and possession for the purpose of the construction of the project.

See Tab D6.

7. If zoning approval is required, attach evidence of application for zoning approval.

No zoning approval is required.

8. If this proposal involves new construction or expansion of patient occupancy, attach evidence from the appropriate state and/or municipal authority of an approved plan for water supply and sewage disposal.

See Tab D8.

9. Provide an estimated date of contract award for this construction project, assuming approval within a 120-day cycle.

The contract should be awarded within 90 days of approval.

10. Assuming this proposal is approved, provide an estimated date (month/year) that the service will be actually offered or a change in service will be implemented. If this service will be phased in, describe what will be done in each phase.

April, 2014

Change in Space Form Instructions

The purpose of this form is to identify the major effects of your proposal on the amount, configuration and use of space in your facility.

Column 1
Column 1 is used to identifying discrete units of space within your facility, which will be affected by this proposal. Enter in Column 1 each discrete service (or type of bed) or department, which as a result of this proposal is:

a.) to utilize newly constructed space
b.) to utilize renovated or modernized space
c.) to vacate space scheduled for demolition

In each of the Columns 3, 4, and 5, you are requested to disaggregate the construction, renovation and demolition components of this proposal by service or department. In each instance, it is essential that the total amount of space involved in new construction, renovation or demolition be totally allocated to these discrete services or departments listed in Column 1.

Column 2
For each service or department listed in Column 1, enter in this column the total amount of space assigned to that service or department at all locations in your facility whether or not the locations are involved in this proposal.

Column 3
For each service or department, please fill in the amount of space which that service or department is to occupy in proposed new construction. The figures in Column 3 should sum to the total amount of space of new construction in this proposal.

Column 4
For each service or department, please fill in the amount of space, which that service or department is to occupy in space to be modernized or renovated. The figures in column 4 should sum to the total amount of space of renovation and modernization in this proposal.

Column 5
For each service or department fill in the amount of currently occupied space which is proposed to be demolished. The figures in Column 5 should sum to the total amount of space of demolition specified in this proposal.

Column 6
For each service or department entered in Column 1, enter in this column the total amount of space which will, upon completion of this project, be assigned to that service or department at all locations in your facility whether or not the locations are involved in this proposal.

Column 7
Subtract from the amount of space shown in Column 6 the amount shown in Column 2. Show an increase or decrease in the amount of space.

Change in Space Form

Please identify and provide a definition for the method used for measuring the space (i.e. gross square footage, net square footage, etc.): **See response to Question 1.**

1. Service or Department Name	2. Current Space Amount	3. New Construction Space Amount	4. Renovation Space Amount	5. Amount of Space Currently Occupied to be Demolished	6. Proposed Space Amount	7. Change [(6)-(2)]
Radiation Therapy Facility	0	9,000	0	0	9,000	9,000
TOTAL:	0	9,000	0	0	9,000	9,000

Appendix E

Acquisition of Health Care Equipment Valued in Excess of $1,000,000 or Tertiary/Specialty Care Equipment

Complete separate copies of this appendix for each piece of such equipment contained in this application.

1. Identify the proposed equipment (and current if it is being replaced) and at least two similar alternative makes or models that were considered for acquisition in the following format

	Current Equipment	Proposed Equipment	Alternative 1	Alternative 2
Type of Equipment	N/A	Linear Accelerator	Linear Accelerator	Linear Accelerator
Name of Manufacturer		Varian	Varian	Elekta
Make and Model Number		Truebeam	Trilogy	Infinity
Capital Cost of Equipment		$3,075,000	$2,700,000	$3,050,000
Operating Cost				

2. Describe the clinical application for which the proposed equipment will be used.

Provision of radiation therapy for cancer care.

3. Please identify the reasons the alternative two options were rejected in favor of the proposed equipment.

The Varian Truebeam is a successor to the Trilogy and will more easily allow newly developed technologies to be added onto the machine that cannot be added to the Trilogy. While not necessary now, these technologies might be important treatment tools in the future. The small price difference makes the Truebeam a smart investment at this point in time and will save the system dollars for costly replacements in the future.

The Elekta Infinity does not completely integrate into the technology network we have already built in Rhode Island and would require additional staff and resources to properly manage. Additionally, the Elekta machine/software do not allow us to perform some important quality checks that we have already built into our Varian systems.

Our parent corporation already has national service relationships with the Varian corporation, and we find them to be reliable caretakers of our equipment.

4. If the proposal is to replace current existing equipment, please provide the following information: **N/A**

	Current Equipment
Date of Acquisition	
Expected Salvage Value	
Remaining Useful Life	
Method of disposition	

5. Please state below the number of new full-time equivalent personnel by job category whom you will hire in order to operate the proposed equipment.

Job Category	Number of FTE's	Payroll Expense
Medical Director	0.25	$60,000
Physicians	1.00	$628,217
Radiation Therapist	2.00	$168,000
Dosimetrists	0.75	$135,000
Physicists	0.75	$180,000
Administrator	0.50	$40,000
RNs	1.00	$72,000
Clerical	1.00	$36,000
Office Financial Manager	1.00	$48,000

6. Please describe below your anticipated utilization for this equipment for each of the three fiscal years following acquisition of this equipment.

Projected	FY 2014	FY 2015	FY 2016
Hours of Operation	8-5	8-5	8-5
Utilization	2,600	3971	4150
Throughput Possible	4,000	6000	6,000
Utilization Rate (%)	65%	66%	69%

Appendix F

Financing

Applicants contemplating the incurrence of a financial obligation for full or partial funding of a certificate of need proposal must complete and submit this appendix.

1. Describe the proposed debt by completing the following:
   a.) type of debt contemplated: **Capital Lease**
   b.) term (months or years): **60 months**
   c.) principal amount borrowed **$2,592,250**
   d.) probable interest rate **9.00%**
   e.) points, discounts, origination fees **N/A**
   f.) likely security **N/A**
   g.) disposition of property (if a lease is revoked) **N/A**
   h.) prepayment penalties or call features **N/A**
   i.) front-end costs (e.g. underwriting spread, feasibility study, legal and printing expense, points etc.) **N/A**
   j.) debt service reserve fund **N/A**

2. Compare this method of financing with at least two alternative methods including tax-exempt bond or notes. The comparison should be framed in terms of availability, interest rate, term, equity participation, front-end costs, security, prepayment provision and other relevant considerations.

	Capital Lease	Operating Lease	Notes
Availability	Yes	Yes	Yes
Interest Rate	9.0%	9.0%	9.0%
Term	60 Months	60 Months	N/A
Equity Participation	33%	0%	N/A
Front-end Costs	N/A	N/A	N/A
Security	N/A	N/A	N/A
Prepayment Provision	N/A	N/A	N/A
Other Relevant Considerations	N/A	N/A	N/A

3. If this proposal involves refinancing of existing debt, please indicate the original principal, the current balance, the interest rate, the years remaining on the debt and a justification for the refinancing contemplated. **N/A**

4. Present evidence justifying the refinancing in Question 3. Such evidence should show quantitatively that the net present cost of refinancing is less than that of the existing debt, or it should show that this project cannot be financed without refinancing existing debt. **N/A**

5. If lease financing for this proposal is contemplated, please compare the advantages and disadvantages of a lease versus the option of purchase. Please make the comparison using the following criteria: term of lease, annual lease payments, salvage value of equipment at lease termination, purchase options, value of insurance and purchase options contained in the lease, discounted cash flows under both lease and purchase arrangements, and the discount rate.

	Capital Lease	Purchase
Term of Lease	60	
Annual Lease Payments	$608,172	
Salvage Value of Equipment at Term	$ 1,887,500	
Purchase Options	$1 buyout	
Value of Insurance	3,775,000	
Value of Purchase Option	N/A	
Discounted Cash Flows	3,376,104	3,775,000
Discount Rate	15.00%	

Also, see Lease versus Purchase Comparison at Tab F5.

6. Present a debt service schedule for the chosen method of financing, which clearly indicates the total amount borrowed and the total amount repaid per year. Of the amount repaid per year, the total dollars applied to principal and total dollars applied to interest must be shown.

	Principal	Interest
Year 1	$433,167.16	$175,004.62
Year 2	467,795.05	141,376.73
Year 3	503,033.56	105,138.21
Year 4	542,085.37	66,086.41
Year 5	584,168.86	24,002.92
Total	$2,529,250.00	$511,608.89

7. Please include herewith an annual analysis of your facility's cash flow for the period between approval of the application and the third year after full implementation of the project.

	Yr. 1	Yr. 2	Yr. 3
Operating Profit	599	1,057	1,259
Plus: Depreciation	463	463	463
Less: Principal Payments	-496	-534	-576
Cash Flow	566	9986	1,146

Appendix G

Ownership Information

All applications must be accompanied by responses to the questions posed herein.

1. List all officers, members of the board of directors, trustees, stockholders, partners and other individuals who have an equity or otherwise controlling interest in the applicant. For each individual, provide their home and business address, principal occupation, position with respect to the applicant, and amount, if any, of the percentage of stock, share of partnership, or other equity interest that they hold.

I. APPLICANT

SOLE MEMBER	MANAGERS
New England Radiation Therapy Management Services, Inc. (100%)	**1. Bryan Carey** **2. Joseph Garcia** **3. Sarah Flaherty**

A. Bryan Carey:

- **Business Address: 2270 Colonial Boulevard, Fort Myers, FL 33907**
- **Principal Occupation: Chief Financial Officer of Radiation Therapy Services, Inc.**

B. Joseph Garcia:

- **Business Address: 2270 Colonial Boulevard, Fort Myers, FL 33907**
- **Principal Occupation: Chief Operating Officer of Radiation Therapy Services, Inc.**

C. Sarah Flaherty:

- **Business Address: 115 Cass Avenue, Woonsocket, RI 02895**
- **Principal Occupation: Regional Director of Radiation Therapy Services, Inc.**

II. ULTIMATE PARENT ENTITY

	MAJORITY SHAREHOLDERS (5% or more)	DIRECTORS	OFFICERS
Radiation Therapy Investments, LLC	1. Vestar Capital Partners V, L.P. 2. Vestar Capital Partners V-A, L.P. 3. Vestar/Radiation Therapy Investments, LLC 4. Daniel E. Dosoretz	1. Daniel E. Dosoretz 2. James H. Rubenstein 3. Howard M. Sheridan 4. Anil Shrivastava 5. Bryan J. Carey 6. Erin Russell 7. James Elrod	1. President: James Elrod 2. Vice President: Erin Russell 3. Secretary: Steven Della Rocca

A. Daniel E. Dosoretz:

- **Business Address: 2270 Colonial Boulevard, Fort Myers, FL 33907**
- **Principal Occupation: President and Chief Executive Officer of Radiation Therapy Investments, LLC and Physician.**

B. James H. Rubenstein:

- **Business Address: 2270 Colonial Boulevard, Fort Myers, FL 33907**
- **Principal Occupation: Physician**

C. Howard M. Sheridan:

- **Business Address: 2270 Colonial Boulevard, Fort Myers, FL 33907**
- **Principal Occupation: Physician**

D. Anil Shrivastava:

- **Business Address: c/o Vestar Capital Partners, 245 Park Avenue, 41st Floor, New York, NY 10167**
- **Principal Occupation: Managing Director of Vestar Capital Partners**

E. Bryan J. Carey:

- **Business Address: 2270 Colonial Boulevard, Fort Myers, FL 33907**
- **Principal Occupation: Chief Financial Officer of Radiation Therapy Services, Inc.**

F. James Elrod:

- **Business Address: c/o Vestar Capital Partners, 245 Park Avenue, 41st Floor, New York, NY 10167**
- **Principal Occupation: Managing Director of Vestar Capital Partners**

G. Erin Russell:

- **Business Address: c/o Vestar Capital Partners, 245 Park Avenue, 41st Floor, New York, NY 10167**
- **Principal Occupation: Principal of Vestar Capital Partners**

H. Steven Della Rocca:

- **Business Address: c/o Vestar Capital Partners, 245 Park Avenue, 41st Floor, New York, NY 10167**
- **Principal Occupation: Managing Director and General Counsel of Vestar Capital Partners**

2. For each individual listed in response to Question 1 above, list all (if any) other health care acilities or entities within or outside Rhode Island in which he or she is an officer, director, trustee, shareholder, partner, or in which he or she owns any equity or otherwise controlling interest. For each individual, please identify: A) the relationship to the facility and amount of interest held, B) the type of facility license held (e.g. nursing facility, etc.), C) the address of the facility, D) the state license #, E) Medicare provider #, and F) any professional accreditation (e.g. JACHO, CHAP, etc.).

I. APPLICANT

A. Bryan Carey:

1. Vice Chairman, Chief Financial Officer and Director of:

a. Radiation Therapy Services Holdings, Inc.

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

b. Radiation Therapy Services, Inc.

(i) Type of facility license: NA
(ii) Address of facility: NA

(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

2. Vice President of:

a. 21st Century Oncology Management Services, Inc.

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

b. 21st Century Oncology of New Jersey, Inc.

(i) Type of facility license: Ambulatory Care Facility
(ii) Address of facility: 130 Carnie Blvd. Voorhees, NJ
(iii) State license No: 23147
(iv) Medicare provider No.: 085814
(v) Professional accreditations: ACRO

c. 21st Century Oncology of Pennsylvania, Inc.

(i) Type of facility license: N/A (No open facilities)
(ii) Address of facility: N/A
(iii) State license No: N/A
(iv) Medicare provider No.: 2322650
(v) Professional accreditations: N/A

d. 21st Century Oncology Services, Inc.

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

e. Arizona Radiation Therapy Management Services, Inc.

(i) Type of facility license: Outpatient Treatment Center
(ii) Address of facility: 7340 East Thomas Rd. Scottsdale, AZ
(iii) State license No: OTC 4232
(iv) Medicare provider No.: Z106337
(v) Professional accreditations: N/A

f. **California Radiation Therapy Management Services, Inc.**

(i) **Type of facility license: NA**
(ii) **Address of facility: NA**
(iii) **State license No: NA**
(iv) **Medicare provider No.: NA**
(v) **Professional accreditations: NA**

g. **Devoto Construction of Southwest Florida, Inc.**

(i) **Type of facility license: NA**
(ii) **Address of facility: NA**
(iii) **State license No: NA**
(iv) **Medicare provider No.: NA**
(v) **Professional accreditations: NA**

h. **Goldsboro Radiation Therapy Services, Inc.**

(i) **Type of facility license: N/A**
(ii) **Address of facility: 2802 McLamb Place Goldsboro, NC**
(iii) **State license No: N/A**
(iv) **Medicare provider No.: 2322650**
(v) **Professional accreditations: N/A**

i. **Michigan Radiation Therapy Management Services, Inc.**

(i) **Type of facility license: NA**
(ii) **Address of facility: NA**
(iii) **State license No: NA**
(iv) **Medicare provider No.: NA**
(v) **Professional accreditations: NA**

j. **Nebraska Radiation Therapy Management Services, Inc.**

(i) **Type of facility license: NA**
(ii) **Address of facility: NA**
(iii) **State license No: NA**
(iv) **Medicare provider No.: NA**
(v) **Professional accreditations: NA**

k. **Nevada Radiation Therapy Management Services, Inc.**

(i) **Type of facility license: NA**
(ii) **Address of facility: NA**
(iii) **State license No: NA**

(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

l. New England Radiation Therapy Management Services, Inc.

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

m. Radiation Therapy School for Radiation Therapy Technology, Inc.

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

n. Radiation Therapy Services International, Inc.

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

o. West Virginia Radiation Therapy Services, Inc.

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

p. 21st Century Oncology of Alabama, LLC

(i) Type of facility license: N/A
(ii) Address of facility: 4274 West Main Street Dothan, AL
(iii) State license No: N/A
(iv) Medicare provider No.: 510G700101
(v) Professional accreditations: ACRO

q. 21st Century Oncology of Harford County, Maryland LLC

(i) Type of facility license: Freestanding Medical Facility

(ii) Address of facility: 1200 Brass Mill Road Belcamp, MD
(iii) State license No: M339
(iv) Medicare provider No.: 336P
(v) Professional accreditations: ACRO

r. 21st Century Oncology of Jacksonville, LLC

(i) Type of facility license: N/A
(ii) Address of facility: 7751 Baymeadows Rd. E. Jacksonville, FL
(iii) State license No: N/A
(iv) Medicare provider No.: AK201
(v) Professional accreditations: N/A

s. 21st Century Oncology of Prince Georges County, Maryland, LLC

(i) Type of facility license: Freestanding Medical Facility
(ii) Address of facility: 7503 Greenway Center Dr. Greenbelt, MD
(iii) State license No: M251
(iv) Medicare provider No.: G02620
(v) Professional accreditations: ACRO

t. 21st Century Oncology of South Carolina, LLC

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

u. 21st Century Oncology, LLC

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

v. American Consolidated Technologies, L.L.C.

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

w. **AHLC, LLC**

(i) **Type of facility license: NA**
(ii) **Address of facility: NA**
(iii) **State license No: NA**
(iv) **Medicare provider No.: NA**
(v) **Professional accreditations: NA**

x. **Asheville CC, LLC**

(i) **Type of facility license: NA**
(ii) **Address of facility: NA**
(iii) **State license No: NA**
(iv) **Medicare provider No.: NA**
(v) **Professional accreditations: NA**

y. **Atlantic Urology Clinics, LLC**

(i) **Type of facility license: NA**
(ii) **Address of facility: NA**
(iii) **State license No: NA**
(iv) **Medicare provider No.: NA**
(v) **Professional accreditations: NA**

z. **Aurora Technology Development, LLC**

(i) **Type of facility license: NA**
(ii) **Address of facility: NA**
(iii) **State license No: NA**
(iv) **Medicare provider No.: NA**
(v) **Professional accreditations: NA**

aa. **Berlin Radiation Therapy Treatment Center, LLC**

(i) **Type of facility license: Freestanding Medical Facility**
(ii) **Address of facility: 314 Franklin Ave. Berlin, MD**
(iii) **State license No: M258**
(iv) **Medicare provider No.: 092N**
(v) **Professional accreditations: ACRO**

bb. **Carolina Radiation and Cancer Treatment Center, LLC**

(i) **Type of facility license: NA**
(ii) **Address of facility: NA**
(iii) **State license No: NA**
(iv) **Medicare provider No.: NA**

(v) **Professional accreditations: NA**

cc. **Carolina Regional Cancer Center, LLC**

(i) **Type of facility license: NA**
(ii) **Address of facility: 4708 Oleander Dr. Myrtle Beach, SC**
(iii) **State license No: NA**
(iv) **Medicare provider No.: 5714**
(v) **Professional accreditations: NA**

dd. **Derm-Rad Investment Company, LLC**

(i) **Type of facility license: NA**
(ii) **Address of facility: NA**
(iii) **State license No: NA**
(iv) **Medicare provider No.: NA**
(v) **Professional accreditations: NA**

ee. **Financial Services of Southwest Florida, LLC**

(i) **Type of facility license: NA**
(ii) **Address of facility: NA**
(iii) **State license No: NA**
(iv) **Medicare provider No.: NA**
(v) **Professional accreditations: NA**

ff. **Gettysburg Radiation, LLC**

(i) **Type of facility license: NA**
(ii) **Address of facility: NA**
(iii) **State license No: NA**
(iv) **Medicare provider No.: NA**
(v) **Professional accreditations: NA**

gg. **Jacksonville Radiation Therapy Services, LLC**

(i) **Type of facility license: N/A**
(ii) **Address of facility: 7751 Baymeadows Rd. E. Jacksonville, FL**
(iii) **State license No: N/A**
(iv) **Medicare provider No.: AK201**
(v) **Professional accreditations: N/A**

hh. **Maryland Radiation Therapy Management Services, LLC**

(i) **Type of facility license: NA**
(ii) **Address of facility: NA**

(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

ii. Medical Developers, LLC

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

jj. New York Radiation Therapy Management Services, LLC

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

kk. North Carolina Radiation Therapy Management Services, LLC

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

ll. Phoenix Management Company, LLC

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

mm. Sampson Accelerator, LLC

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

nn. Sampson Simulator, LLC

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

oo. 21st Century Oncology of El Segundo, LLC

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

pp. 21st Century Oncology-CHW, LLC

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

qq. Central Massachusetts Comprehensive Cancer Center, LLC

(i) Type of facility license: Clinic
(ii) Address of facility: 55 Sayles Street Southbridge, MA
(iii) State license No: 469M
(iv) Medicare provider No.: 0011459
(v) Professional accreditations: ACR

rr. SW Florida Derm-Rad Management, LLC

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

3. Chief Financial Officer of:

a. 21st Century Oncology of Kentucky, LLC

(i) Type of facility license: Free Standing Ambulatory Care Facility
(ii) Address of facility: 520 Techwood Dr. Danville, KY
(iii) State license No: 730037
(iv) Medicare provider No.: 7864

(v) Professional accreditations: ACRO

b. 21st Century Oncology of California, A Medical Corporation

(i) Type of facility license: NA
(ii) Address of facility: 2428 Santa Monica Blvd. Santa Monica, CA
(iii) State license No: NA
(iv) Medicare provider No.: W19907
(v) Professional accreditations: NA

c. Katin Radiation Therapy, P.A.

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

d. Massachusetts Oncology Services, PC

(i) Type of facility license: NA
(ii) Address of facility: 5 Hospital Drive Holyoke, MA
(iii) State license No: NA
(iv) Medicare provider No.: MA-M21697
(v) Professional accreditations: ACR

e. Michael J. Katin, M.D., Prof. Corp.

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

f. New Jersey Oncology Services, P.C.

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

g. Radiation Therapy Associates of Western North Carolina, P.A.

(i) Type of facility license: NA
(ii) Address of facility: 20 Medical Park Dr. Asheville, NC

(iii) State license No: NA
(iv) Medicare provider No.: 2322650
(v) Professional accreditations: NA

h. RADS, P.C. Oncology Professionals

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

i. Redding Radiation Oncologists, P.C.

(i) Type of facility license: NA
(ii) Address of facility: 963 Butte Street Redding, CA
(iii) State license No: NA
(iv) Medicare provider No.: BK819
(v) Professional accreditations: NA

j. X-Ray Treatment Center, P.C.

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

k. Yonkers Radiation Medical Practice, P.C.

(i) Type of facility license: NA
(ii) Address of facility: 970 N. Broadway Yonkers, NY
(iii) State license No: NA
(iv) Medicare provider No.: W1L091
(v) Professional accreditations: ACRO

4. Treasurer and Manager of:

a. Ambergris, LLC

(i) Type of facility license: NA
(ii) Address of facility: NA
(iii) State license No: NA
(iv) Medicare provider No.: NA
(v) Professional accreditations: NA

5. **Treasurer of:**

   a. **New York Proton Management, LLC**

      (i) **Type of facility license: NA**
      (ii) **Address of facility: NA**
      (iii) **State license No: NA**
      (iv) **Medicare provider No.: NA**
      (v) **Professional accreditations: NA**

   b. **Roger Williams Radiation Therapy, LLC**

      (i) **Type of facility license: Organized Ambulatory Care Facility**
      (ii) **Address of facility: 50 Maude Street Providence, RI**
      (iii) **State license No: ACF01595**
      (iv) **Medicare provider No.: 929005335**
      (v) **Professional accreditations: ACRO**

   c. **South County Radiation Therapy, LLC**

      (i) **Type of facility license: Organized Ambulatory Care Facility**
      (ii) **Address of facility: 142 Kenyon Avenue Wakefield, RI**
      (iii) **State license No: ACF01596**
      (iv) **Medicare provider No.: 929004398**
      (v) **Professional accreditations: ACRO**

   d. **Southern New England Regional Cancer Center, LLC**

      (i) **Type of facility license: Organized Ambulatory Care Facility**
      (ii) **Address of facility: 115 Cass Ave. Woonsocket, RI**
      (iii) **State license No: ACF01594**
      (iv) **Medicare provider No.: 709003933**
      (v) **Professional accreditations: ACRO**

6. **Trustee of:**

   a. **Medical Developers Cooperatief**

      (i) **Type of facility license: NA**
      (ii) **Address of facility: NA**
      (iii) **State license No: NA**
      (iv) **Medicare provider No.: NA**
      (v) **Professional accreditations: NA**

b. **Medical Developers Holdings, B.V.**

(i) **Type of facility license: NA**
(ii) **Address of facility: NA**
(iii) **State license No: NA**
(iv) **Medicare provider No.: NA**
(v) **Professional accreditations: NA**

B. Joseph Garcia: None

C. Sarah Flaherty: None

II. ULTIMATE PARENT ENTITY

A. Daniel E. Dosoretz:

1. **CEO and Director of Radiation Therapy Services Holdings, Inc. (see Appendix G, #2, Section I(A)(1)(a)).**

2. **President of New York Proton Management, LLC (see Appendix G, #2, Section I(A)(5)(a)).**

3. **President, CEO and Director/Manager [1] (as appropriate) of the entities listed in Appendix G, #2, Sections: I(A)(1)(b); I(A)(2)(a-rr); I(A)3(a); I(A)4(a); and I(A)(5)(b-d).**

4. **Vice President of the entities listed in Appendix G, #2, Sections I(A)(3)(b-e, g-j) and is also a director of I(A)(3)(d).**

B. James H. Rubenstein:

1. **Director of Radiation Therapy Services Holdings, Inc. (see Appendix G, #2, Section I(A)(1)(a)).**

2. **Secretary and Director/Manager[2] (as appropriate) of the entities listed in Appendix G, #2, Sections I(A)(1)(b); I(A)(2)(a-rr); I(A)(3)(a); and I(A)(5)(b, c).**

---

[1] Daniel E. Dosoretz is not a manager of the following entities: American Consolidated Technologies, L.L.C.; Berlin Radiation Therapy Treatment Center, LLC; Derm-Rad Investment Company, LLC; Financial Services of Southwest Florida, LLC; Gettysburg Radiation, LLC; Phoenix Management Company, LLC ; 21st Century Oncology of El Segundo, LLC; 21st Century Oncology-CHW, LLC; Central Massachusetts Comprehensive Cancer Center, LLC; New York Proton Management, LLC; or SW Florida Derm-Rad Management, LLC.

[2] James H. Rubenstein is not a manager of the following entities: Devoto Construction of Southwest Florida, Inc.; 21st Century Oncology of South Carolina, LLC; American Consolidated Technologies, L.L.C.; Atlantic Urology Clinics, LLC; Berlin

3. **Secretary only of the entities listed in Appendix G, #2, Sections I(A)(3)(d, f, h, i, j).**

4. **Treasurer only of entities listed in Appendix G, #2, Sections I(A)(3)(c, e, g).**

5. **Assistant Treasurer only of the entity listed in Appendix G, #2, Section I(A)(3)(b).**

6. **Secretary, Treasurer and Shareholder of the entity listed in Appendix G, #2, Section I(A)(3)(k).**

C. Howard M. Sheridan:

1. **Director of Radiation Therapy Services Holdings, Inc. (see Appendix G, #2, Section I(A)(1)(a)).**

2. **Director/Manager (as appropriate) of the entities listed in Appendix G, #2, Sections I(A)(1)(b); I(A)(2)(a-f, h-s, u, w, x, z, bb, gg, hh, jj, kk, mm, nn); and I(A)(3)(a).**

D. Anil Shrivastava:

1. **Director of Radiation Therapy Services Holdings, Inc. (see Appendix G, #2, Section I(A)(1)(a)).**

2. **Director of Radiation Therapy Services, Inc. (see Appendix G, #2, Section I(A)(1)(b)).**

3. **Board Member of MediMedia, Sunrise Medical, and DeVilbiss**

E. Bryan J. Carey: See Appendix G, #2, Sections I(A), *et seq*.

1. **Board Member of Sunrise Medical**

F. Erin Russell:

1. **Vice President and Director of Radiation Therapy Services Holdings, Inc. (see Appendix G, #2, Section I(A)(1)(a)).**

2. **Director of Radiation Therapy Services, Inc. (see Appendix G, #2, Section I(A)(1)(b)).**

3. **Board Member of DynaVox**

Radiation Therapy Treatment Center, LLC; Carolina Regional Cancer Center, LLC; Derm-Rad Investment Company, LLC; Financial Services of Southwest Florida, LLC; Gettysburg Radiation, LLC; Medical Developers, LLC; Phoenix Management Company, LLC; 21st Century Oncology of El Segundo, LLC; 21st Century Oncology-CHW, LLC; Central Massachusetts Comprehensive Cancer Center, LLC; Roger Williams Radiation Therapy, LLC; South County Radiation Therapy, LLC; or SW Florida Derm-Rad Management, LLC.

G. James Elrod:

1. **President and Director of Radiation Therapy Services Holdings, Inc. (see Appendix G, #2, Section I(A)(1)(a)).**

2. **Chairman of the Board and Director of Radiation Therapy Services, Inc. (see Appendix G, #2, Section I(A)(1)(b)).**

3. **Board Member of National Mentor**

H. Steven Della Rocca:

1. **Secretary of Radiation Therapy Services Holdings, Inc. (see Appendix G, #2, Section I(A)(1)(a)).**

2. **No other interests in healthcare entities**

3. If any individual listed in response to Question 1 above, has any business relationship with the applicant, including but not limited to: supply company, mortgage company, or other lending institution, insurance or professional services, please identify each such individual and the nature of each relationship.

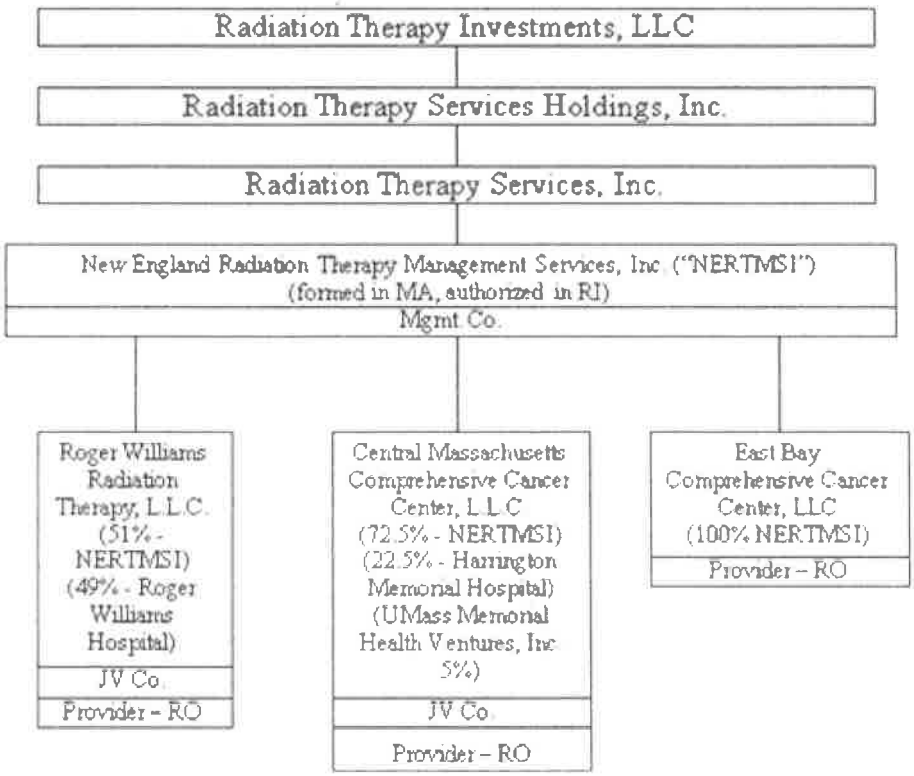
N/A

4. Have any individuals listed in response to Question 1 above been convicted of any state or federal criminal violation within the past 20 years? Yes___ No_**X**_.

NERTMS is not party to any violations

5. Please provide organization chart for the applicant, identifying all "parent" entities with direct or indirect ownership in or control of the applicant, all "sister" legal entities also owned or controlled by the parent(s), and all subsidiary entities owned by the applicant. Please provide a brief narrative clearly explaining the relationship of these entities, the percent ownership the principals have in each (if applicable), and the role of each and every legal entity that will have control over the applicant.

- **East Bay Comprehensive Cancer Care, LLC is wholly owned by New England Radiation Therapy Management Services, Inc.;**
- **New England Radiation Therapy Management Services, Inc. is wholly owned by Radiation Therapy Services, Inc.;**
- **Radiation Therapy Services, Inc. is wholly owned by Radiation Therapy Services Holdings, Inc.;**
- **Radiation Therapy Holdings, Inc. is wholly owned by Radiation Therapy Investments, LLC;**
- **Radiation Therapy Investments, LLC: See Appendix G, #1 for list of majority shareholders (holding 5% or more).**



Sister entities to NERTMSI are as follows:

1. **21st Century Oncology Management Services, Inc.**
2. **21st Century Oncology of Alabama, LLC**
3. **21st Century Oncology of Jacksonville, LLC**
4. **21st Century Oncology of Kentucky, LLC**
5. **21st Century Oncology of New Jersey, Inc.**
6. **21st Century Oncology of Pennsylvania, Inc.**
7. **21st Century Oncology of South Carolina, LLC**
8. **21st Century Oncology, LLC**
9. **21st Century Oncology Services, Inc.**
10. **Arizona Radiation Therapy Management Services, Inc.**
11. **Aurora Technology Development, LLC**
12. **California Radiation Therapy Management Services, Inc.**
13. **Derm-Rad Investment Company, LLC**
14. **Devoto Construction of Southwest Florida, Inc.**
15. **Financial Services of Southwest Florida, LLC**
16. **Jacksonville Radiation Therapy Services, LLC**
17. **Maryland Radiation Therapy Management Services, LLC**
18. **Michigan Radiation Therapy Management Services, Inc.**
19. **Nevada Radiation Therapy Management Services, Inc.**

20. **New England Radiation Therapy Management Services, Inc.**
21. **New York Radiation Therapy Management Services, LLC**
22. **North Carolina Radiation Therapy Management Services, LLC**
23. **Radiation Therapy School for Radiation Therapy Technology, Inc.**
24. **Radiation Therapy Services International, Inc.**
25. **West Virginia Radiation Therapy Services, Inc.**

The sister entities do not have a direct relationship with NERTMSI and are in no way involved in the operation of East Bay. The sister entities are wholly owned by RTSI and are either management or provider entities.

East Bay does not maintain interests in any other entities.

6. Please list all licensed healthcare facilities (in Rhode Island or elsewhere) owned, operated or controlled by any of the entities identified in response to Question 5 above (applicant and/or its principals). For each facility, please identify: A) the entity, applicant or principal involved, B) the type of facility license held (e.g. nursing facility, etc.), C) the address of the facility, D) the state license #, E) Medicare provider #, and F) any professional accreditation (e.g. JACHO, CHAP, etc.).

   See Tab G6.

7. Have any of the facilities identified in Question 5 or 6 above had: A) federal conditions of participation out of compliance, B) decertification actions, or C) any actions towards revocation of any state license? Yes ___ No **X**

   - If response is 'Yes', please identify the facility involved, the nature of each incident, and the resolution of each incident.

8. Have any of the facilities owned, operated or managed by the applicant and/or any of the entities identified in Question 5 or 6 above during the last 5-years had bankruptcies and/or were placed in receiverships? Yes___ No **X**

   - If response is 'Yes', please identify the facility and its current status.

9. For applications involving establishment of a new entity or involving out of state entities, please provide the following documents:

   - Certificate and Articles of Incorporation and By-Laws (for corporations)
   - Certificate of Partnership and Partnership Agreement (for partnerships)
   - Certificate of Organization and Operating Agreement (for limited liability corporations)

   See Tab G9.

Exhibit 1

Article Extract

Surgical perspectives from a prospective, nonrandomized, multicenter study of breast conserving surgery and adjuvant electronic brachytherapy for the treatment of breast cancer

William C Dooley[1*], **Ozer Algan**[2], **Kambiz Dowlatshahi**[3], **Darius Francescatti**[4], **Elizabeth Tito**[5,6], **J David Beatty**[7], **Art G Lerner**[8], **Betsy Ballard**[9] and **Susan K Boolbol**[10]

World Journal of Surgical Oncology 2011, **9**:30

Background

The treatment of breast cancer has advanced considerably in the last two decades due to earlier detection, improved techniques for staging, development of alternative surgical approaches and radiation technologies, and coordination of multidisciplinary teams to implement multi-faceted treatment programs [1,2]. With the shift from mastectomy to breast-conserving surgery has come the reliance on post-operative adjuvant radiation therapy as an integral part of the local treatment regimen to the breast [3-5]. However, studies have shown that some patients opt for a mastectomy rather than lose time from family or work traveling to a distant radiation facility and/or undergoing a lengthy radiation treatment such as with conventional whole breast irradiation (WBI) [6-9].

BRIEF COMMUNICATION

Relationship of Distance From a Radiotherapy Facility and Initial Breast Cancer Treatment

Ann Butler Nattinger, Ronald T. Kneusel, Raymond G. Hoffmann, Mary Ann Gilligan

Substantial variation has been described in the use of breast-conserving surgery (BCS) for early-stage breast cancer *(1–4)* and in the receipt of radiotherapy by patients undergoing BCS *(2,4–6)*. Increased use of BCS is associated with urban residence and with treatment in a hospital with radiotherapy available *(1,3)*.

These findings raise the question of whether the distance that a patient must travel to a radiotherapy facility affects the likelihood that BCS will be used or that the patient will receive radiotherapy in conjunction with BCS *(4,5,7)*. According to current guidelines, women undergoing BCS should receive postoperative radiotherapy to decrease the likelihood of local disease recurrence *(8)*. Radiotherapy is typically provided in treatments that are given 5 days per week for 5–6 weeks *(9,10)*.

To address these issues, we studied patients from the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER)[1] registry national public-use database, by using methods similar to those that we described previously *(6)*. Patients from Hawaii were excluded because of the unusual geographic characteristics of this state.

A cohort was selected of 21 135 women who were aged 30 years or older at the time of first diagnosis of a stage I or II unilateral breast cancer during the period from 1991 through 1992 and who underwent BCS or mastectomy. The 1990 U.S. Census tract of residence for each patient was determined from SEER records, and the latitude and longitude of the census tract were determined from the ZIP Code Equivalency file of the U.S. Bureau of the Census *(11)*. Census tracts were unavailable from SEER for years of diagnosis after 1992. The size of the metropolitan statistical area (MSA) of residence of each patient was determined from the 1990 U.S. Census, as was the percent of adults living in the patient's census tract who had a college education (a proxy indicator of socioeconomic status) *(12)*. Information on census tract or socioeconomic status was unavailable for 3406 women, leaving a final study cohort of 17 729 women.

Hospitals offering radiotherapy services were determined from the 1990 American Hospital Association (AHA) Annual Survey of Hospitals *(13)*. Of the 1257 such hospitals, the latitude and longitude of 87% were determined from the 1997 AHA Survey *(14)*. (The 1997 AHA Survey was the first year to include hospital latitude and longitude.) For those hospitals not included in the 1997 AHA Survey, we determined the latitude and longitude of the centroid of the hospital's ZIP code from the U.S. Bureau of the Census *(15)*. For each patient in the cohort, the hospital with the shortest distance from the census tract of residence of that patient was determined by a standard formula for computing the distance between two coordinates of latitude and longitude *(16)*.

Of the 17 729 women in the study cohort, 88.0% were white, 54.9% had stage I disease, and almost 58.3% underwent mastectomy therapy. Of the 7384 patients who underwent BCS, 74.8% underwent radiotherapy, and 2.7% had an unknown status with respect to radiotherapy. The median distance from a hospital with a radiotherapy facility was 4.1 miles, and 89.2% of the patients lived within 15 miles of such a hospital.

Women residing an increased distance from a hospital with a radiotherapy facility had a decreased likelihood of undergoing BCS (Table 1). The lower probability of undergoing BCS was statistically significant for women residing 15 miles or more from the nearest hospital with a radiotherapy facility (odds ratio [OR] = 0.52; 95% confidence interval [CI] = 0.46 to 0.58). We had postulated that any relationship of distance to radiotherapy site and therapy undergone might be more prominent among older women because older women may have more difficulties with transportation *(17)*. However, when the analysis was limited to the 8095 (45.7%) women in the cohort aged 65 years and older, the results were virtually the same as for the entire cohort (Table 1).

Among the 7187 women who underwent BCS and for whom receipt of radiotherapy was known, a statistically significant decrease in the probability of receipt of radiotherapy (OR = 0.55; 95% CI = 0.37 to 0.82) was observed for women living 40 miles or more from a radiotherapy site (Table 1). However, only 1.7% of the patients who received BCS lived this far from a hospital providing radiotherapy.

We were further interested in whether the distance from a radiotherapy facility explained the differential use of BCS previously observed in relation to geographic region and population density. Thus, we assessed the fit of incremental logistic regression models. The likelihood ratio test for a logistic model using the patient covariates plus distance from radiotherapy site was statistically significantly different from a model including only the patient covariates as predictors of receipt of BCS ($P<.001$, Table 2). When the size of the MSA in which the patient resides was added to the model including distance, the likelihood ratio test was again statistically significant for the difference between the two models ($P<.001$, Table 2), which implies that MSA size contributes explanatory power incremental to that of the distance from the radiotherapy site and the patient characteristics. Similarly, when the SEER site was added to the model with radiotherapy distance, the likelihood ratio test was statistically significantly different between the two models ($P<.001$, Table 2), suggesting that geographic region also adds predictive value incremental to that of distance and the patient characteristics.

Using an analogous set of comparisons, we found that the size of the MSA and the SEER geographic site also each

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See "Notes" following "References."

Table 1. Effect of distance of patient residence to nearest hospital with a radiotherapy facility on the receipt of breast-conserving surgery (BCS) and on radiotherapy after BCS

Distance from hospital with radiotherapy facility, miles	Overall OR* (95% CI)	OR* if ≥65 y old (95% CI)
	Receipt of BCS versus mastectomy	
<5	Referent	Referent
5 to <10	1.08 (1.00 to 1.06)	1.07 (0.95 to 1.20)
10 to <15	1.07 (0.95 to 1.19)	0.98 (0.82 to 1.18)
15 to <20	0.76 (0.62 to 0.92)	0.72 (0.52 to 0.99)
20 to <30	0.61 (0.50 to 0.75)	0.49 (0.37 to 0.66)
30 to <40	0.44 (0.34 to 0.58)	0.32 (0.22 to 0.45)
≥40	0.43 (0.35 to 0.53)	0.42 (0.31 to 0.56)
	Receipt of radiotherapy among BCS patients	
0 to <10	Referent	Referent
10 to <20	0.79 (0.65 to 0.94)	0.76 (0.57 to 1.01)
20 to <30	1.03 (0.68 to 1.55)	0.81 (0.46 to 1.40)
30 to <40	0.91 (0.55 to 1.51)	0.97 (0.47 to 2.01)
≥40	0.55 (0.37 to 0.82)	0.56 (0.32 to 0.97)

*Adjusted for age, stage of disease, race, educational status [which have previously been shown to be determinants of use of BCS *(1,2,18)*] with a logistic regression model. There was no substantive difference between adjusted and unadjusted results (not shown). The analyses of receipt of radiotherapy among patients undergoing BCS had a substantially smaller sample size. Therefore, larger categories of distance were required for analysis. OR = odds ratio; CI = confidence interval.

Table 2. Incremental explanatory effect of distance from RT site, size of MSA, and SEER site on breast cancer treatment*

Model components†	LR test	*P*	R^2
Use of BCS vs. mastectomy			
1) Covariates	—	—	—
2) Covariates + distance	151.9 with 6 *df* (vs. model 1)	<.001	.275
3) Covariates + distance + MSA size	79.7 with 2 *df* (vs. model 2)	<.001	.282
4) Covariates + distance + SEER site	389.3 with 7 *df* (vs. model 2)	<.001	.311
Use of RT among BCS patients			
5) Covariates	—	—	—
6) Covariates + distance	13.8 with 4 *df* (vs. model 5)	.008	.368
7) Covariates + distance + MSA size	56.4 with 2 *df* (vs. model 6)	<.001	.377
8) Covariates + distance + SEER site	237.3 with 8 *df* (vs. model 6)	<.001	.405

*MSA = metropolitan statistical area; SEER = Surveillance, Epidemiology, and End Results Registry; LR = likelihood ratio; RT = radiotherapy.

†For these analyses, logistic regression models were constructed, incrementally including the distance factor and then the population density or SEER site (geographic region) factors. The incremental fit of these models was assessed with the LR test *(18)*. An R^2 statistic was used as a measure of the predictive power of the different models *(18)*. Covariates refer to the patient characteristics of age, race, stage of disease, and educational status. All statistical tests are two-sided.

have incremental explanatory power in a model including patient characteristics and distance as predictors of receipt of radiotherapy after undergoing BCS (Table 2).

In summary, we found a statistically significant decrease in the likelihood of undergoing BCS among women residing 15 miles or more from a hospital with radiotherapy facilities. Among women who underwent BCS, a lower probability of undergoing radiotherapy was observed consistently only among those residing 40 miles or more from a hospital with radiotherapy facilities. However, distance did not account for all of the previously described *(1–3,19)* geographic variation in treatment or for the previously demonstrated *(1,3)* fact that women residing in more urban areas have greater use of BCS than other women.

Some unmeasured factor, such as a health systems factor, could account for the observed association between distance from a radiotherapy facility and treatment. However, our results regarding distance and receipt of radiotherapy after BCS are similar to those obtained in a study of patients in New Mexico *(20)*. Although that study did not find an association between receipt of BCS and the distance to a radiotherapy site, our larger sample size gave us better power to detect this association.

The decreased use of BCS among breast cancer patients living 15 miles or more from a radiotherapy site does not necessarily mean that these women undergo inappropriate care. Modified radical mastectomy is an appropriate treatment option for women with early-stage breast cancer *(8)*. Nonetheless, these women may not perceive access to BCS as a realistic treatment option. The finding of a lower use of radiotherapy among BCS recipients living 40 miles or more from a hospital with a radiotherapy facility, however, does raise an issue of appropriateness of care *(6)*. Radiotherapy is clearly recommended for women who undergo breast conservation as primary therapy *(8)*, and women who undergo BCS without radiotherapy have local recurrence rates of about 35% over a 5-year period *(21–24)*.

Although the distance of more than 15 miles from a radiotherapy site had a moderate effect on the receipt of BCS, only 11% of the women in this cohort lived 15 miles or more away from a radiotherapy facility. Similarly, only 3.1% of the entire study cohort and 1.7% of the BCS patients lived 40 miles or more away from a hospital with radiotherapy. Although the SEER population is somewhat more urban than the population in the rest of the United States *(25)*, only a reassuringly small percentage of the U.S. population is likely to be affected by the findings of this study.

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NOTES

[1]*Editor's note:* SEER is a set of geographically defined, population-based, central cancer registries in the United States, operated by local nonprofit organizations under contract to the National Cancer Institute (NCI). Registry data are submitted electronically without personal identifiers to the NCI on a biannual basis, and the NCI makes the data available to the public for scientific research.

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Travel Distance to Radiation Therapy and Receipt of Radiotherapy Following Breast-Conserving Surgery

William F. Athas, Meg Adams-Cameron, William C. Hunt, Andrew Amir-Fazli, Charles R. Key

Breast-conserving surgery (BCS) followed by radiation therapy is an efficacious alternative treatment to mastectomy for women with early-stage breast cancer *(1,2)*. However, 15%–30% of the women treated with BCS for early-stage disease fail to undergo postoperative breast irradiation, despite the known increased risk of ipsilateral recurrence associated with the omission of radiotherapy *(3–8)*. Older age has been identified as a major determinant of not receiving radiotherapy after BCS *(4,6,7,9)*. Other factors that could account for failure to receive radiation therapy, particularly among younger women, remain to be identified.

Travel distance to a radiation-treatment facility may influence the receipt of postoperative breast irradiation. Radiotherapy that follows BCS typically involves daily treatments (weekends excluded), for a period of 5–6 consecutive weeks. The necessity of long-distance travel may increase the inconvenience or cost of radiotherapy to a point where it simply is not feasible to receive treatment. A study of breast cancer treatment conducted in the mid- to late-1980s in the Seattle–Puget Sound area found that living in a county without a radiation-treatment facility was associated with a 50% lower likelihood of receiving radiotherapy after BCS *(4)*. A similar contemporaneous study in New Mexico *(3)* found no relationship between radiotherapy and travel distance, but the analysis was limited to manual identification of geographic clustering of BCS patients not receiving radiotherapy. In this study, we used a geographic information system (GIS) to measure actual patient travel distances to radiation-treatment facilities to more precisely examine the relationship between travel distance and receipt of radiotherapy after BCS.

For our analysis, all cases of localized breast cancer diagnosed in 1994 and 1995 in female residents of New Mexico were selected from the New Mexico Tumor Registry (NMTR) database. The NMTR, a member of the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) Program,[1] collects information on all cases of cancer in New Mexico residents by use of the methods previously described *(3,8)*. Native-American women were excluded from the analysis because the NMTR does not record their addresses at diagnosis. Stage of cancer at diagnosis was coded according to the SEER Summary Staging Guide *(10)*, which defines localized cancer as an invasive cancer confined to the organ of origin. For classification of patients by treatment received, we considered all therapy that occurred in the first 4 months of cancer-directed therapy, the standard SEER definition for the first course of therapy. Surgery was classified as either mastectomy or BCS. BCS included lumpectomy or excisional biopsy, quadrantectomy, wedge resection, partial mastectomy, and subcutaneous mastectomy. For the BCS case subjects, we considered that adjuvant radiotherapy was received if the NMTR record documented radiotherapy during the first course of therapy.

The address at diagnosis was obtained for each case subject from the NMTR database and geocoded by use of ArcView 3.0a software (Environmental Systems Research Institute, Redlands, CA). Approximately 70% of the case subjects were geocoded to a unique street address. The remaining 30% of the subjects, most of whom had either post office boxes or rural routes as their addresses, were geocoded to the centroids of their ZIP codes. Twelve radiation-treatment facilities were operational in New Mexico or in nearby areas in 1995. Four facilities were located in Albuquerque, NM; two in Las Cruces, NM; one each in Santa Fe, NM, Roswell, NM, Farmington, NM, and Carlsbad, NM; and one each in El Paso, TX, and Durango, CO. Each treatment facility was geocoded to a unique street address. We assumed that each patient was treated at the nearest facility and used the GIS to calculate the shortest travel distance to it.

A total of 1122 women diagnosed with localized breast cancer were included in the analysis. Of these, 533 (48%) were treated with BCS, and 409 (77%) received radiation therapy following BCS (Table 1). Age was a strong and statistically significant predictor of post-BCS radiotherapy (two-sided P for trend <.0001). Among women less than 60 years of age, 83% received follow-up breast irradiation compared with 79% of those aged 60–69 years and 63% of those 70 years and older. After adjusting for the effects of race/ethnicity and travel distance, patients 70 years and older were roughly three times less likely to receive radiotherapy after BCS compared with patients younger than 60 years. Race/ethnicity was not predictive for receipt of radiotherapy following BCS.

After adjustment for age, the likelihood of receiving radiotherapy following BCS decreased significantly with increasing travel distance to the nearest

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See "Notes" following "References."

Table 1. Effect of age, race/ethnicity, and travel distance to nearest radiation-treatment facility on the likelihood of receiving radiation therapy (RT) following breast-conserving surgery (BCS) for early-stage breast cancer (New Mexico, 1994–1995)

	No. of case patients	No. who received BCS (%)	No. who received RT following BCS (%)	Odds ratio (95% CI)*	*P* for trend†
All	1122	533 (48)	409 (77)		
Age, y					
<50	248	131 (53)	107 (82)	1.00 (referent)	
50–59	236	141 (60)	120 (85)	1.24 (0.64–2.44)	
60–69	257	112 (44)	88 (79)	0.88 (0.45–1.72)	
≥70	381	149 (39)	94 (63)	0.36 (0.20–0.64)	<.0001
Race/ethnicity					
White, non-Hispanic	810	391 (48)	295 (75)	1.00 (referent)	
White, Hispanic	270	123 (46)	97 (79)	0.84 (0.49–1.43)	
Other	42	19 (45)	17 (89)	2.01 (0.40–10.2)	
Travel distance, miles					
<10.0	621	298 (48)	243 (82)	1.00 (referent)	
10.0–24.9	158	87 (55)	75 (86)	1.22 (0.61–2.45)	
25.0–49.9	76	40 (53)	31 (78)	0.64 (0.28–1.46)	
50.0–74.9	79	26 (33)	18 (69)	0.48 (0.19–1.19)	
75.0–99.9	100	51 (51)	29 (57)	0.26 (0.14–0.50)	
≥100.0	88	31 (35)	13 (42)	0.13 (0.06–0.30)	<.0001

*Odds ratios and 95% confidence intervals (CIs) were adjusted for age, race/ethnicity, and travel distance by use of multiple logistic regression.
†Tests for trend were computed by fitting logistic regression models to continuous values of the variables. All *P* values are two-sided.

radiation-treatment facility (two-sided *P* for trend <.0001). Only 51% of the women living 75 miles or more from the closest facility received follow-up radiotherapy compared with 69% of those living 50–74.9 miles away and 82% of those residing within 50 miles' travel distance. The percentage of women receiving BCS compared with those who received mastectomy did not vary according to travel distance for radiotherapy (data not shown).

To illustrate the travel-distance relationship on a continuous scale, a smoothed plot of the adjusted log-odds and travel distance was produced by use of a generalized additive model (Fig. 1). A square-root transformation of travel distance was used to spread out the data and to provide greater visual clarity for distances less than 20 miles. The likelihood of receiving radiotherapy after BCS increased slightly with travel distance to approximately 10 miles, then declined steadily at greater distances.

Our finding of a significant inverse relationship between travel distance and receipt of radiotherapy following BCS could, in part, reflect an inability to accurately establish administration of radiotherapy for case subjects residing in outlying areas. This seems unlikely, given that NMTR personnel routinely review treatment information at all radiation facilities in the state and nearby out-of-state areas to document therapy as completely as possible. Our substitution of ZIP code centroids for street addresses for those case subjects without a unique address at diagnosis also may have produced a spurious result. Again, this seems unlikely, since travel distances calculated from unique street addresses were strongly correlated (Pearson $r = .97$) with distances calculated

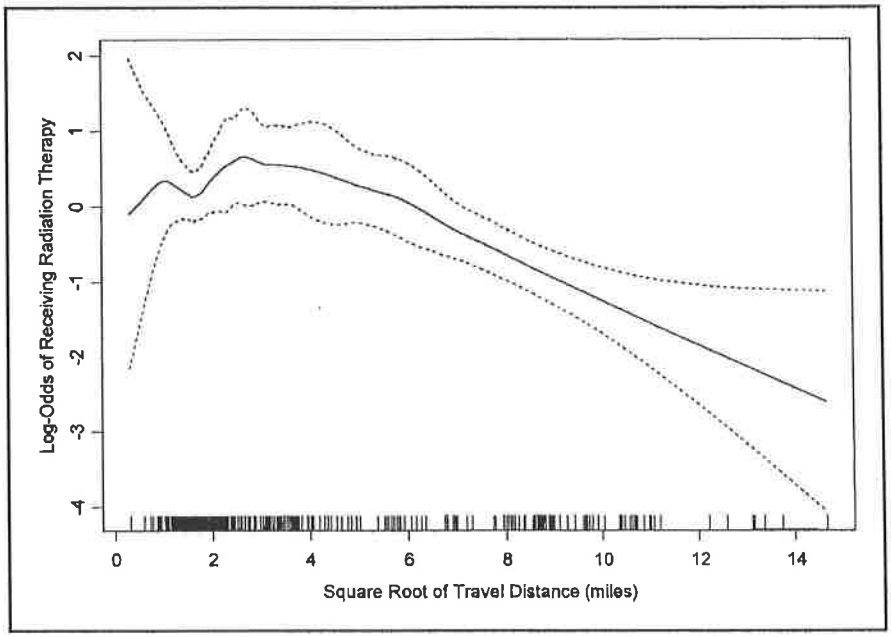

Fig. 1. Log-odds of receiving radiation therapy following breast-conserving surgery for early-stage breast cancer is plotted against the square root of travel distance to the nearest radiation-treatment facility. The smooth curve (**solid line**) was produced by use of a generalized additive model *(11)* computed with the "gam" function of S-PLUS *(12)*. The model, a generalization of the usual logistic regression model, allows the effect of travel distance to be incorporated as an arbitrary smooth function. We chose a locally weighted running-line smoother (S-PLUS LOESS) with a span of 0.50. With this LOESS smoother, the fitted value at each observed travel distance is computed from a weighted logistic regression by use of the 50% of the data that are nearest to the target point. The weight given to each data point decreases rapidly with the distance from the target point. The model contained an LOESS term for age and an indicator for non-Hispanic white race/ethnicity. Approximate 95% pointwise confidence intervals for the curve are given (**dashed lines**), and the "rug" at the base of the figure shows the frequency distribution of travel distances.

from corresponding ZIP code centroids. We also believe that calculating travel distances by assuming treatment at the nearest radiation-treatment facility did not introduce a serious misclassification error into our analysis. The small number of treatment facilities (n = 12) and the relatively large distances between major population centers in New Mexico likely mean that most patients receive radiotherapy as close to home as possible.

A number of factors may influence the observed association between travel distance and radiation treatment, including socioeconomic status, type of health care insurance, and regional practice patterns. Such factors were not examined in this study and warrant further investigation. Our observation that travel distance did not influence whether a patient received BCS or whether she received mastectomy suggests that little geographic variation in practice style in the use of adjuvant radiotherapy occurs in New Mexico. We are currently conducting a survey of New Mexico women treated only with BCS for early-stage breast cancer to gain insight into why they did not receive adjuvant radiation therapy. Results from our ongoing study should assist in the interpretation of the findings reported here.

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Notes

[1] *Editor's note:* SEER is a set of geographically defined, population-based, central cancer registries in the United States, operated by local nonprofit organizations under contract to the National Cancer Institute (NCI). Registry data are submitted electronically without personal identifiers to the NCI on a biannual basis, and the NCI makes the data available to the public for scientific research.

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Table 4. DISTANCE FROM MEDICAL CENTER

	Compliant	Noncompliant	Total
Within city limits	13 (35%)	21 (65%)	34
Outside city limits	7 (33%)	14 (67%)	21

Table 4. DISTANCE FROM MEDICAL CENTER

Patient Compliance to Radiation for Advanced Head and Neck Cancer at a Tertiary Care County Hospital□

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Keywords:
Head and neck cancer; county hospitals; radiation; organ preservation; compliance

Abstract

Background: Combined chemotherapy and radiotherapy are routinely used to treat advanced-stage head and neck squamous cell carcinoma (HNSCC). Patient compliance is often difficult given increased toxicities. Medically underserved or uninsured patients may lack the necessary support to complete such treatment.

Objective: To evaluate compliance to radiation therapy for patients with advanced stage HNSCC at an urban tertiary-care county hospital.

Study Design: Retrospective review.

Methods: Data were extracted from the charts of 136 consecutive patients who had been advised to undergo chemoradiotherapy for newly diagnosed HNSCC from 2004 to 2006. Demographic and tumor-related information was collected, as was patient compliance with radiation treatment. Total dose, length of treatment, and theoretical □oss of loco-regional control□was calculated. Benchmark compliance data were obtained from select publications.

Results: Of 136 patients, 55 did not begin treatment or transferred care elsewhere, leaving 81 study patients. Twenty-eight patients (35%) had unacceptable overall treatment courses. Forty-eight patients (59%) received less than the effective dose of 65 Gy after accounting for missed treatment days. Fifty-one patients (63%) had a greater than 10% calculated loss in loco-regional control. Univariate and multivariate analysis yielded no predictive value for gender, ethnicity, node status, stage, or primary site on compliance.

Conclusion: Compared with other institutions, HNSCC patients in this setting are less likely to complete a prescribed therapeutic regimen. Patient and tumor characteristics measured in this study do not predict compliance. Organ preservation protocols require further evaluation in populations where compliance is suspect. Future research must examine interventions to improve compliance and assessment of its impact on survival.

Factors affecting therapeutic compliance: A review from the patient's perspective

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Objective: To explore and evaluate the most common factors causing therapeutic non-compliance.

Methods: A qualitative review was undertaken by a literature search of the Medline database from 1970 to 2005 to identify studies evaluating the factors contributing to therapeutic non-compliance.

Results: A total of 102 articles was retrieved and used in the review from the 2095 articles identified by the literature review process. From the literature review, it would appear that the definition of therapeutic compliance is adequately resolved. The preliminary evaluation revealed a number of factors that contributed to therapeutic non-compliance. These factors could be categorized to patient-centered factors, therapy-related factors, social and economic factors, healthcare system factors, and disease factors. For some of these factors, the impact on compliance was not unequivocal, but for other factors, the impact was inconsistent and contradictory.

Conclusion: There are numerous studies on therapeutic noncompliance over the years. The factors related to compliance may be better categorized as "soft" and "hard" factors as the approach in countering their effects may differ. The review also highlights that the interaction of the various factors has not been studied systematically. Future studies need to address this interaction issue, as this may be crucial to reducing the level of non-compliance in general, and to enhancing the possibility of achieving the desired healthcare outcomes.

Keywords: patient compliance, adherence, factors

Introduction

The ultimate aim of any prescribed medical therapy is to achieve certain desired outcomes in the patients concerned. These desired outcomes are part and parcel of the objectives in the management of the diseases or conditions. However, despite all the best intention and efforts on the part of the healthcare professionals, those outcomes might not be achievable if the patients are non-compliant. This shortfall may also have serious and detrimental effects from the perspective of disease management. Hence, therapeutic compliance has been a topic of clinical concern since the 1970s due to the widespread nature of non-compliance with therapy. Therapeutic compliance not only includes patient compliance with medication but also with diet, exercise, or life style changes. In order to evaluate the possible impact of therapeutic non-compliance on clinical outcomes, numerous studies using various methods have been conducted in the United States (USA), United Kingdom (UK), Australia, Canada and other countries to evaluate the rate of therapeutic compliance in different diseases and different patient populations. Generally speaking, it was estimated that the compliance rate of long-term medication therapies was between 40% and 50%. The rate of compliance for short-term therapy was much higher at between 70% and 80%, while the compliance with lifestyle changes was the lowest at 20%–30% (DiMatteo 1995). Furthermore, the rates of non-compliance with different types of treatment also differ greatly. Estimates

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showed that almost 50% of the prescription drugs for the prevention of bronchial asthma were not taken as prescribed (Sabaté 2003). Patients' compliance with medication therapy for hypertension was reported to vary between 50% and 70% (Sabaté 2003). In one US study, Monane et al found that antihypertensive compliance averaged 49%, and only 23% of the patients had good compliance levels of 80% or higher (Monane et al 1996). Among adolescent outpatients with cancer, the rate of compliance with medication was reported to be 41%, while among teenagers with cancer it was higher at between 41% and 53% (Tebbi et al 1986). For the management of diabetes, the rate of compliance among patients to diet varied from 25% to 65%, and for insulin administration was about 20% (Cerkoney and Hart 1980). More than 20 studies published in the past few years found that compliance with oral medication for type 2 diabetes mellitus ranged from 65% to 85% (Rubin 2005). As previously mentioned, if the patients do not follow or adhere to the treatment plan faithfully, the intended beneficial effects of even the most carefully and scientifically-based treatment plan will not be realized. The above examples illustrate the extent of the problem of therapeutic non-compliance and why it should be a concern to all healthcare providers.

Definition of compliance

To address the issue of therapeutic non-compliance, it is of first and foremost importance to have a clear and acceptable definition of compliance. In the Oxford dictionary, compliance is defined as the practice of obeying rules or requests made by people in authority (Oxford Advanced Learner's Dictionary of Current English). In healthcare, the most commonly used definition of compliance is "patient's behaviors (in terms of taking medication, following diets, or executing life style changes) coincide with healthcare providers' recommendations for health and medical advice" (Sackett 1976). Thus, therapeutic non-compliance occurs when an individual's health-seeking or maintenance behavior lacks congruence with the recommendations as prescribed by a healthcare provider. Other similar terms have been used instead of compliance, and the meaning is more or less identical. For example, the term adherence is often used interchangeably with compliance. Adherence is defined as the ability and willingness to abide by a prescribed therapeutic regimen (Inkster 2006). Recently, the term "concordance" is also suggested to be used. Compared with "compliance", the term concordance makes the patient the decision-maker in the process and denotes patients-prescribers agreement and harmony (Vermeire et al 2001). Although there are slight and subtle differences between these terms, in clinical practice, these terms are used interchangeably (albeit may not be totally correctly). Therefore, the more commonly used term of compliance will be used throughout this article.

Types of non-compliance

After defining what is meant by compliance, the next question that comes to mind to the healthcare providers would be: "What are the common types of non-compliance encountered in clinical medicine?" A knowledge and understanding of the various types of non-compliance commonly encountered in clinical practice would allow the formulation of strategies to tackle them effectively. A review of the literature reveals several types of commonly reported or detected non-compliance. (Table 1) Besides the types of non-compliance encountered, another logical question to ask in trying to complete the jigsaw puzzle of therapeutic non-compliance would be: "In clinical medicine, what is considered to be good or acceptable compliance?" Although it must be acknowledged that this is still controversial, in relation to good medication compliance, it has commonly been defined as taking 80 to 120% of the medication prescribed (Sackett et al 1975; Monane et al 1996; Avorn et al 1998; Hope et al 2004). For compliance with other treatment such as exercise or diet, the definition of acceptable compliance varied among different studies and there does not seem to be any commonly accepted criterion to define good or acceptable compliance.

Problems with therapeutic non-compliance

Before we can formulate strategies to tackle the issue of therapeutic non-compliance, we need to assess the clinical and other implications of therapeutic non-compliance.

From the perspective of healthcare providers, therapeutic compliance is a major clinical issue for two reasons. Firstly, non-compliance could have a major effect on treatment outcomes and direct clinical consequences. Non-compliance is directly associated with poor treatment outcomes in patients with diabetes, epilepsy, AIDS (acquired immunodeficiency syndrome), asthma, tuberculosis, hypertension, and organ transplants (Sabaté 2003). In hypertensive patients, poor compliance with therapy is the most important reason for poorly controlled blood pressure, thus increasing the risk of stroke, myocardial infarction, and renal impairment markedly. Data from the third NHANES (the National Health and Nutrition Examination Survey), which provides periodic information on the health of the US population, showed that blood pressure was controlled in only 31% of

Table 1 Type of reported non-compliance

Type of non-compliance	Reference
Receiving a prescription but not filling it	Donovan and Blake 1992
Taking an incorrect dose	
Taking medication at the wrong times	
Increasing or decreasing the frequency of doses	
Stopping the treatment too soon	
Delaying in seeking healthcare	Vermeire et al 2001
Non-participation in clinic visits	
Failure to follow doctor's instructions	Gordis 1979
"Drug holidays", which means the patient stops the therapy for a while and then restarts the therapy	Cummings et al 1982;Vermeire 2001
"White-coat compliance", which means patients are compliant to the medication regimen around the time of clinic appointments	Cramer et al 1990; Feinstein 1990; Vermeire 2001; Burnier et al 2003

the hypertension patients between 1999 and 2000 (Hajjar and Kotchen 2003). It is likely that non-compliance with treatment contributed to this lack of blood pressure control among the general population. For therapeutic non-compliance in infectious diseases, the consequences can include not only the direct impact such as treatment failures, but also indirect impact or negative externalities as well via the development of resistant microorganisms (Sanson-Fisher et al 1992). In addition, it has been shown that almost all patients who had poor compliance with drugs eventually dropped out of treatments completely, and therefore did not benefit at all from the treatment effects (Lim and Ngah 1991).

Besides undesirable impact on clinical outcomes, non-compliance would also cause an increased financial burden for society. For example, therapeutic non-compliance has been associated with excess urgent care visits, hospitalizations and higher treatment costs (Bond and Hussar 1991, Svarstad et al 2001). It has been estimated that 25% of hospital admissions in Australia, and 33%–69% of medication-related hospital admissions in the USA were due to non-compliance with treatment regimens (Sanson-Fisher et al 1992; Osterberg and Blaschke 2005). Additionally, besides direct financial impact, therapeutic non-compliance would have indirect cost implications due to the loss of productivity, without even mentioning the substantial negative effect on patient's quality of life.

Furthermore, as a result of undetected or unreported therapeutic non-compliance, physicians may change the regimen, which may increase the cost or complexity of the treatment, thus further increasing the burden on the healthcare system. The cost burden has been estimated at US$100 billion each year in the USA alone (Vermeire et al 2001). Prescription drug cost is the fastest growing component of healthcare costs in the USA. National outpatient drug spending has increased by 13 to 16% per year during the past few years, and it is expected to continue to grow by 9%–13% per year during the coming decade (Sokol et al 2005). In the era where cost-effectiveness is a buzz word in healthcare delivery, any factors that could contribute to increased drug use should be a concern for the healthcare providers.

Hence, from both the perspective of achieving desirable clinical and economic outcomes, the negative effect of therapeutic non-compliance needs to be minimized. However, in order to formulate effective strategies to contain the problem of non-compliance, there is a need to systematically review the factors that contribute to non-compliance. An understanding of the predictive value of these factors on non-compliance would also contribute positively to the overall planning of any disease management program.

Objectives

To conduct a systematic qualitative review to identify the most common factors causing therapeutic non-compliance from the patient's perspective.

Methods

Literature searches were undertaken through the Medline database from 1970 to 2005. The following MeSH (medical subject heading) terms were used: treatment refusal, patient compliance, and patient dropouts. MeSH terms provide a consistent way to retrieve information that may use different terminology for the same concepts. Besides MeSH terms, the following key words were also searched in the title or abstract: factors, predictors and determinants.

Only English-language journal articles with abstracts were included. The populations were adolescents aged 13–18 years and adults aged 19 years or older. Clinical trials were excluded since they were carried out under close monitoring and therefore the compliance rates reported would not be generalizable. Articles which were categorized by Medline

in subsets on AIDS, bioethics, history of medicine, space life sciences and toxicology were not included as well.

Abstracts of identified articles were retrieved manually to select original studies and reviews which mainly focused on the topics of interest. The topics of interest in the field of patient compliance were: factors that influence therapeutic non-compliance and the extent of non-compliance with treatment. Only non-compliance studies from the patient's perspective were selected. Original studies that included fewer than 50 patients were eliminated because of inadequate sample size. If the sample population of studies was very specific, such as involving only males or females, or recruiting patients from one specific class (homeless, prisoners or workers from one employer, etc), they were eliminated as well because results from these studies might not be generalizable to the general population. In addition, a number of articles were excluded if they mainly focused on strategies to enhance patient's compliance, methods to measure compliance, validating instruments to identify factors influencing non-compliance and the effect of non-compliance. When the abstracts were not clear enough to decide whether articles met the inclusion criteria, full articles were read to make the decision.

Results

A total of 2095 articles were retrieved in this process, and after the culling process, 102 articles met the inclusion criteria. The rest were excluded for the reasons such as small sample size, not focused on factors affecting compliance, not from patients' perspective, etc (Figure 1). The impact of these factors on therapeutic non-compliance would be discussed in details in the subsequent sections.

Factors identified

The factors identified from the studies and reviews may be grouped into several categories, namely, patient-centered factors, therapy-related factors, healthcare system factors, social and economic factors, and disease factors (Table 2).

Patient-centered factors

Demographic factors

Factors identified to be in this group include patient's age, ethnicity, gender, education, and marital status. A summary of the impact of these factors on therapeutic compliance is presented (Table 3).

Age

More than thirty retrieved articles were related to this factor. The majority of the studies showed that age was related to compliance, although a few researchers found age not to be a factor causing non-compliance (Lorenc and Branthwaite 1993; Menzies et al 1993; Wild et al 2004; Wai et al 2005). From a review of the articles showing a correlation between age and non-compliance, it would appear that the effect of age could be divided into 3 major groups: the elderly group (over 55 years old), the middle-age group (40 to 54 years old) and the young group (under 40 years old).

For elderly people, the results from the various studies are not unidirectional. A large proportion of retrieved studies suggested that they might have higher compliance (Norman et al 1985; Didlake et al 1988; Schweizer et al 1990; Shea et al 1992; Frazier et al 1994; McLane et al 1995; Shaw et al 1995; Monane et al 1996; Buck et al 1997; Viller et al 1999; Sirey et al 2001; Kim et al 2002; Senior et al 2004; Hertz et al 2005). In a study carried out in UK, patients over 60 years old were more likely to be always compliant with their anti-epileptic tablets than patients under 60 years old (86% vs 66%, respectively) (Buck et al 1997). It was also suggested that patients' antidepressant drug compliance was positively related to age over 60 years (Sirey et al 2001). These results are consistent with the conclusion from another published review (Krousel-Wood et al 2004). In addition, four studies focusing on younger people (mean age 46–50 yr) indicated the same trend that compliance increased with the increasing age (Degoulet et al 1983; Christensen and Smith 1995; Caspard et al 2005; Lacasse et al 2005).

However, some studies found that advancing age affected compliance among elderly people in the opposite direction (Okuno et al 1999; Benner et al 2002; Balbay et al 2005). Nevertheless, there were confounding factors in these studies. The study by Balbay et al was carried out in a rural area of Turkey among patients with tuberculosis and found that younger patients were more compliant to treatment than older patients (mean age 42 yr vs 50 yr) (Balbay et al 2005). The researchers stated that this might be due to the low education level of older patients. Similarly, the study by Okuno et al suggested that home-care patients aged 80 and over were less likely to be compliant with their prescribed medication, but the participants in that particular study had physical disabilities which limit its generalizability (Okuno et al 1999).

Several studies also attempted to venture plausible reasons for poorer compliance among elderly patients. Elderly patients may have problems in vision, hearing and memory. In addition, they may have more difficulties in following therapy instructions due to cognitive impairment or other physical difficulties, such as having problems in swallowing tablets, opening drug containers, handling small tablets,

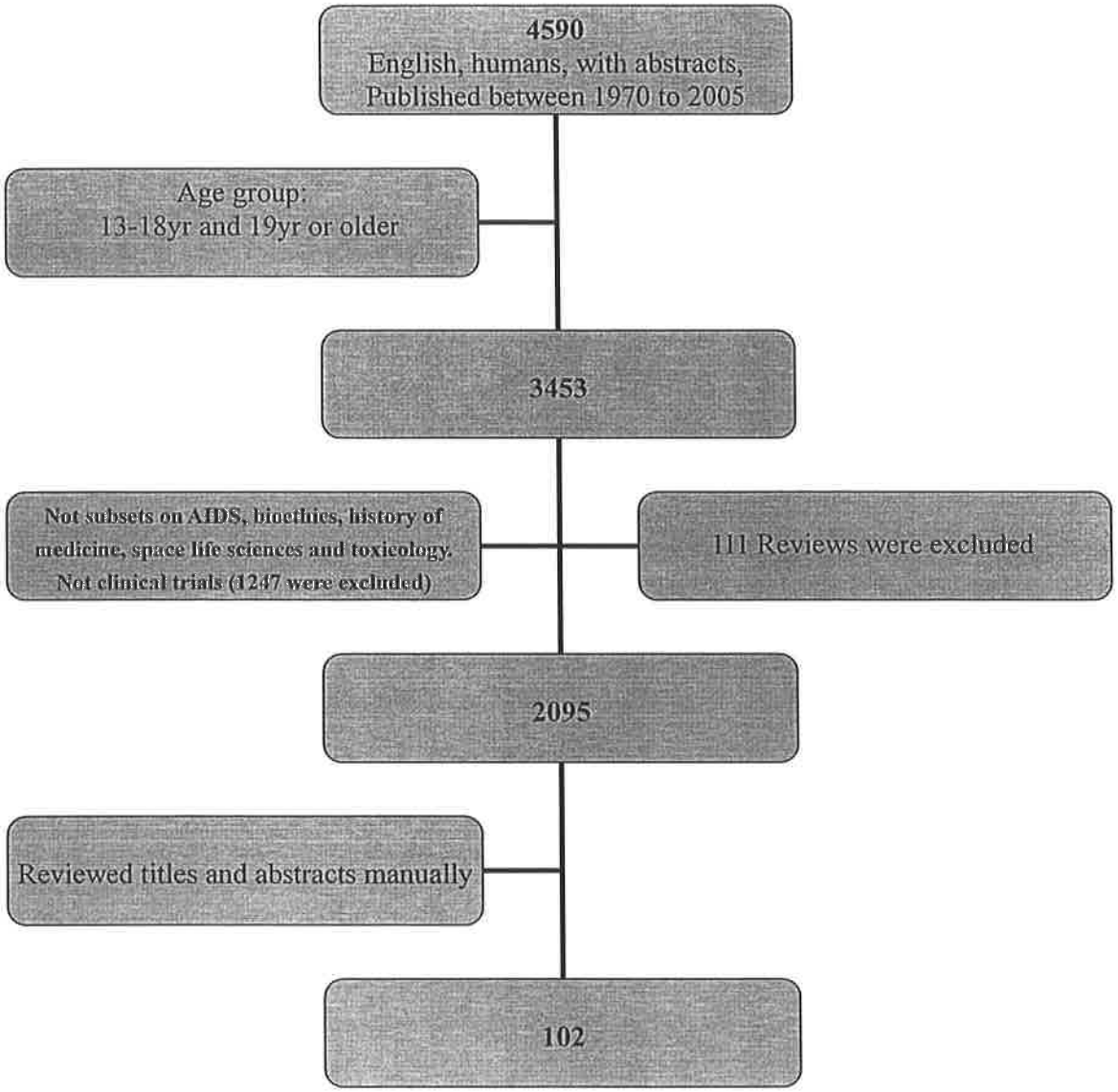

Figure 1 Retrieval and culling process of the articles in literature review process.

distinguishing colors or identifying markings on drugs. (Murray et al 1986; Stewart and Caranasos 1989; Chizzola et al 1996; Nikolaus et al 1996; Okuno et al 2001; Benner et al 2002; Jeste et al 2003; Cooper et al 2005). On the contrary, older people might also have more concern about their health than younger patients, so that older patients' non-compliance is non-intentional in most cases. As a result, if they can get the necessary help from healthcare providers or family members, they may be more likely to be compliant with therapies.

In comparison, the impact of younger age on compliance is much more congruent among the studies. Middle-aged patients were less likely to be compliant to therapy. In Japan, patients in the prime of their life (40–59 years) were found less likely to be compliant to the medication (Iihara et al 2004). Similarly, young patients under 40 years also have a low compliance rate (Neeleman and Mikhail 1997; Leggat et al 1998; Loong 1999; Siegal and Greenstein 1999). In Singapore, patients less than 30 years old were found to be less likely to collect the medication prescribed at a polyclinic (Loong 1999). In a study about patients' compliance with hemodialysis, patients aged 20 to 39 years were poorly compliant (Leggat et al 1998). Patients in these two age ranges (middle-aged patients and young patients under 40 years old) always have other priorities in their daily life. Due to

Table2 Categories of factors identified from the literature review

Category	Factors
Patient-centered factors	Demographic Factors: *Age, Ethnicity, Gender, Education, Marriage Status*
	Psychosocial factors: *Beliefs, Motivation, Attitude*
	Patient-prescriber relationship
	Health literacy
	Patient knowledge
	Physical difficulties
	Tobacco Smoking or alcohol intake
	Forgetfulness
	History of good compliance
Therapy-related factors	Route of administration
	Treatment complexity
	Duration of the treatment period
	Medication side effects
	Degree of behavioral change required
	Taste of the medication
	Requirements for drug storage
Healthcare system factors	Lack of accessibility
	Long waiting time
	Difficulty in getting prescriptions filled
	Unhappy clinic visits
Social and economic factors	Inability to take time off work
	Cost and Income
	Social support
Disease factors	Disease symptoms
	Severity of the disease

their work and other commitments, they may not be able to attend to treatment or spend a long time waiting for clinic appointments.

Likewise, low compliance also occurs in adolescents and children with chronic disease (Buck et al 1997; Kyngas 1999). Very young children need more help from their parents or guardians to implement treatment. Therefore, their poorer compliance may be due to a lack of understanding or other factors relating to their parents or guardians. For adolescents, this period is often marked by rebellious behavior and disagreement with parents and authorities (Tebbi 1993). They usually would prefer to live a normal life like their friends. This priority could therefore influence their compliance.

Ethnicity

Race as a factor causing non-compliance has been studied fairly widely in the USA and European countries and sixteen studies on this factor were retrieved. Caucasians are believed to have good compliance according to some studies (Didlake et al 1988; Sharkness and Snow 1992; Turner et al 1995; Raiz et al 1999; Thomas et al 2001; Yu et al 2005), while African-Americans, Hispanics and other minorities were found to have comparatively poor compliance (Schweizer et al 1990; Monane et al 1996; Leggat et al 1998; Benner et al 2002; Apter et al 2003; Opolka et al 2003; Spikmans et al 2003; Butterworth et al 2004; Kaplan et al 2004; Dominick et al 2005). However, a plausible explanation for this may be due to patient's lower socio-economic status and language barriers of the minority races in the study countries. Hence, due to these confounding variables, ethnicity may not be a true predictive factor of poorer compliance.

Gender

In the twenty-two studies retrieved related to this factor, the results are contradictory. Female patients were found by some researchers to have better compliance (Degoulet et al 1983; Chuah 1991; Shea et al 1992; Kyngas and Lahdenpera 1999; Viller et al 1999; Kiortsis et al 2000; Lindberg et al 2001; Balbay et al 2005; Choi-Kwon 2005; Fodor et al 2005; Lertmaharit et al 2005), while some studies suggested otherwise (Frazier et al 1994; Sung et al 1998; Caspard et al 2005; Hertz et al 2005). In addition, some studies could not find a relationship between gender and compliance (Menzies et al 1993; Buck et al 1997; Horne and Weinman 1999; Ghods and Nasrollahzadeh 2003; Spikmans et al 2003; Senior et al 2004). This is consistent with another literature review on compliance in seniors

Table 3 The effect of demographic factors on compliance

Factor	Reference		
	Increased compliance	Decreased compliance	No effect
Age (elderly)	Norman et al 1985; Didlake et al 1988; Schweizer et al 1990; Shea et al 1992; Frazier et al 1994; McLane et al 1995; Shaw et al 1995; Monane et al 1996; Buck et al 1997; Viller et al 1999; Sirey et al 2001; Kim et al 2002; Senior et al 2004; Hertz et al 2005	Okuno et al 1999; Benner et al 2002; Balbay et al 2005	Lorenc and Branthwaite 1993; Menzies et al 1993; Wild et al 2004; Wai et al 2005
Age (middle-aged)		Iihara et al 2004	
Age (young)		Buck et al 1997; Neeleman and Mikhail 1997; Leggat et al 1998; Kyngas 1999; Loong 1999; Siegal and Greenstein 1999	
Ethnicity Caucasian	Didlake et al 1988; Sharkness and Snow 1992; Turner et al 1995; Raiz et al 1999; Thomas et al 2001; Yu et al 2005		
Minorities			Schweizer et al 1990; Monane et al 1996; Leggat et al 1998; Benner et al 2002; Apter et al 2003; Opolka et al 2003; Spikmans et al 2003; Butterworth et al 2004; Kaplan et al 2004; Dominick et al 2005
Gender (female)	Degoulet et al 1983; Chuah 1991; Shea et al 1992; Kyngas and Lahdenpera 1999; Viller et al 1999; Kiortsis et al 2000; Lindberg et al 2001; Balbay et al 2005; Choi-Kwon 2005; Fodor et al 2005; Lertmaharit et al 2005	Frazier et al 1994; Sung et al 1998; Caspard et al 2005; Hertz et al 2005	Menzies et al 1993; Buck et al 1997; Horne and Weinman 1999; Ghods and Nasrollahzadeh 2003; Spikmans et al 2003; Senior et al 2004
Education level (higher)	Apter et al 1998; Okuno et al 2001; Ghods and Nasrollahzadeh 2003; Yavuz et al 2004	Kyngas and Lahdenpera 1999; Senior et al 2004	Norman et al 1985; Horne and Weinman 1999; Spikmans et al 2003; Kaona et al 2004; Stilley et al 2004; Wai et al 2005
Marital status (married)	Swett and Noones 1989; Frazier et al 1994; De Geest et al 1995; Turner et al 1995; Cooper et al 2005		Spikmans et al 2003; Ghods and Nasrollahzadeh 2003; Kaona et al 2004; Wild et al 2004; Yavuz et al 2004

that concluded that gender has not been found to influence compliance (Vic et al 2004). Gender may not be a good predictor of non-compliance because of the inconsistent conclusions.

Educational level

The effect of educational level on non-compliance was equivocal after reviewing thirteen articles which focused on the impact of educational level as they used different criteria for "higher" and "lower" education. Several studies found that patients with higher educational level might have higher compliance (Apter et al 1998; Okuno et al 2001; Ghods and Nasrollahzadeh 2003; Yavuz et al 2004), while some studies found no association (Norman et al 1985; Horne and Weinman 1999; Spikmans et al 2003; Kaona et al 2004; Stilley et al 2004; Wai et al 2005). Intuitively, it may be expected that patients with higher educational level should have better knowledge about the disease and therapy and therefore be more compliant. However, DiMatteo found that even highly educated patients may not understand their conditions or believe in the benefits of being compliant to their medication regimen (DiMatteo 1995). Other researchers showed that patients with lower education level have better compliance (Kyngas and Lahdenpera 1999; Senior et al 2004). A UK study group found that patients without formal educational qualifications had better compliance with cholesterol-lowering medication (Senior et al 2004). Patients with lower educational level might have more trust in physicians' advice. From these results, it seems that educational level may not be a good predictor of therapeutic compliance.

Marital status

Marital status might influence patients' compliance with medication positively (Swett and Noones 1989; Frazier et al 1994; De Geest et al 1995; Turner et al 1995; Cooper et al 2005). The help and support from a spouse could be the reason why married patients were more compliant to medication than single patients. However, marital status was not found to be related to patient's compliance in five recent studies (Ghods and Nasrollahzadeh 2003; Spikmans et al 2003; Kaona et al 2004; Wild et al 2004; Yavuz et al 2004). This disparity might be due to the fact that the recent studies investigated the effect of marital status in disease conditions which were different from those evaluated in the older studies, with the impact being masked by the disease factor.

Psychological factors

Patient's beliefs, motivation and negative attitude towards therapy were identified as factors to be included in this category.

Patients' beliefs and motivation about the therapy

Twenty-three articles were identified for this factor in the review process. From the results, patients' beliefs about the causes and meaning of illness, and motivation to follow the therapy were strongly related to their compliance with healthcare (Lim and Ngah 1991; Buck et al 1997; Cochrane et al 1999; Kyngas 1999; Kyngas 2001; Kyngas and Rissanen 2001; Vincze et al 2004).

In summarizing the findings from the various studies, it would appear that compliance was better when the patient had the following beliefs:

- The patient feels susceptible to the illness or its complication (Haynes et al 1980; Abbott et al 1996; Spikmans et al 2003).
- The patient believes that the illness or its complications could pose severe consequences for his health (McLane et al 1995; Sirey et al 2001; Loffler et al 2003).
- The patient believes that the therapy will be effective or perceives benefits from the therapy (Lorenc and Branthwaite 1993; De Geest et al 1995; Cochrane et al 1999; Horne and Weinman 1999; Apter et al 2003; Spikmans et al 2003; Krousel-Wood et al 2004; Wild et al 2004; Gonzalez et al 2005; Seo and Min 2005).

On the contrary, misconceptions or erroneous beliefs held by patients would contribute to poor compliance. Patient's worries about the treatment, believing that the disease is uncontrollable and religious belief might add to the likelihood that they are not compliant to therapy. In a review to identify patient's barriers to asthma treatment compliance, it was suggested that if the patients were worried about diminishing effectiveness of medication over time, they were likely to have poor compliance with the therapy (Bender and Bender 2005). In patients with chronic disease, the fear of dependence on the long-term medication might be a negative contributing factor to compliance (Apter et al 2003; Bender and Bender 2005). This is sometimes augmented further by cultural beliefs. For example, in Malaysia, some hypertension patients believed long-term use of "Western" medication was "harmful", and they were more confident in herbal or natural remedies (Lim and Ngah 1991). In a New Zealand study, Tongan patients may think disease is God's will and uncontrollable; and as a consequence, they perceived less need for medication (Barnes et al 2004). Similarly, in Pakistan, inbred fears and supernatural beliefs were reported

to be two major factors affecting patients' compliance with treatment (Sloan and Sloan 1981).

Patients who had low motivation to change behaviors or take medication are believed to have poor compliance (Lim and Ngah 1991; Hernandez-Ronquillo et al 2003; Spikmans et al 2003). In a study done in Malaysia, 85% of hypertension patients cited lack of motivation as the reason for dropping out of treatment (Lim and Ngah 1991).

Negative attitude towards therapy

Fifteen studies showed an association between patients' negative attitude towards therapy (eg, depression, anxiety, fears or anger about the illness) and their compliance (Lorenc and Branthwaite 1993; Bosley et al 1995; Carney et al 1995; Milas et al 1995; Jette et al 1998; Clark et al 1999; Raiz et al 1999; Sirey et al 2001; Barnes et al 2004; Gascon et al 2004; Iihara et al 2004; Kaplan et al 2004; Stilley et al 2004; Kilbourne et al 2005; Yu et al 2005). In one study conducted in patients older than 65 years with coronary artery disease, depression affected compliance markedly (Carney et al 1995). There were other studies reporting that for children or adolescents, treatment may make them feel stigmatized (Bender and Bender 2005), or feel pressure because they are not as normal as their friends or classmates (Kyngas 1999). Therefore, negative attitude towards therapy should be viewed as a strong predictor of poor compliance.

Patient-prescriber relationship

Seventeen articles evaluated the effect of the patient-prescriber relationship to patient's compliance. From these articles it could be concluded that patient-prescriber relationship is another strong factor which affects patients' compliance (Buck et al 1997; Roter and Hall 1998; Stromberg et al 1999; Kiortsis et al 2000; Okuno et al 2001; Kim et al 2002; Loffler et al 2003; Moore et al 2004; Gonzalez et al 2005). A healthy relationship is based on patients' trust in prescribers and empathy from the prescribers. Studies have found that compliance is good when doctors are emotionally supportive, giving reassurance or respect, and treating patients as an equal partner (Moore et al 2004; Lawson et al 2005). Rubin mentioned some situations that may influence patients' trust in physicians (Rubin 2005). For example, physicians who asked few questions and seldom made eye contact with patients, and patients who found it difficult to understand the physician's language or writing. More importantly, too little time spent with patients was also likely to threaten patient's motivation for maintaining therapy (Lim and Ngah 1991; Gascon et al 2004; Moore et al 2004; Lawson et al 2005).

Poor communication with healthcare providers was also likely to cause a negative effect on patient's compliance (Bartlett et al 1984; Apter et al 1998). Lim and Ngah showed in their study that non-compliant hypertension patients felt the doctors were lacking concern for their problems (Lim and Ngah 1991). In addition, multiple physicians or healthcare providers prescribing medications might decrease patients' confidence in the prescribed treatment (Vlasnik et al 2005).

These findings demonstrate the need for cooperation between patients and healthcare providers and the importance of good communication. To build a good and healthy relationship between patients and providers, providers should have patients involved in designing their treatment plan (Gonzalez et al 2005; Vlasnik et al 2005), and give patients a detailed explanation about the disease and treatment (Butterworth et al 2004; Gascon et al 2004). Good communication is also very important to help patients understand their condition and therapy (Lorenc and Branthwaite 1993).

Health literacy

Health literacy means patients are able to read, understand, remember medication instructions, and act on health information (Vlasnik et al 2005). Patients with low health literacy were reported to be less compliant with their therapy (Nichols-English and Poirier 2000). On the contrary, patients who can read and understand drug labels were found to be more likely to have good compliance (Murray et al 1986; Lorenc and Branthwaite 1993; Butterworth et al 2004). Thus, using written instructions and pictograms on medicine labels has proven to be effective in improving patient's compliance (Dowse and Ehlers 2005; Segador et al 2005).

Patient knowledge

Patient's knowledge about their disease and treatment is not always adequate. Some patients lack understanding of the role their therapies play in the treatment (Ponnusankar et al 2004); others lack knowledge about the disease and consequences of poor compliance (Alm-Roijer et al 2004; Gascon et al 2004); or lack understanding of the value of clinic visits (Lawson et al 2005). Some patients thought the need for medication was intermittent, so they stopped the drug to see whether medication was still needed (Vic et al 2004; Bender and Bender 2005). For these reasons, patient education is very important to enhance compliance. Counseling about medications is very useful in improving patient's compliance (Ponnusankar et al 2004). Healthcare providers should give patients enough education about the

treatment and disease (Haynes et al 1980; Norman et al 1985; Stanton 1987; Olubodun et al 1990; Lorenc and Branthwaite 1993; Menzies et al 1993; Milas et al 1995; Chizzola et al 1996; Hungin 1999; Liam et al 1999; Okuno et al 1999; Viller et al 1999; Lindberg et al 2001; Thomas et al 2001; Gascon et al 2004; Iihara et al 2004; Kaona et al 2004; Ponnusankar et al 2004; Seo and Min 2005).

However, education is not always "the more the better". An "inverted U" relationship between knowledge and compliance existed in adolescents. Adolescent patients who knew very little about their therapies and illness were poor compliers, while patients who were adequately educated about their disease and drug regimens were good compliers; but patients who knew the life-long consequences might show poor compliance (Hamburg and Inoff 1982). Nevertheless, there is no report of similar observations in other age groups. In addition, patients' detailed knowledge of the disease was not always effective. In Hong Kong, researchers could not find any association between diabetes knowledge and compliance. They suggested that there was a gap between what the patients were taught and what they were actually doing (Chan and Molassiotis 1999).

In addition, the content of education is crucial. Rubin found that educating the patients about their disease state and general comprehension of medications would increase their active participation in treatment (Rubin 2005). Making sure patients understand the drug dosing regimen could also improve compliance (Olubodun et al 1990). To make sure patients remember what was taught, written instructions work better than verbal ones, as patients often forget physician's advice and statements easily (Tebbi 1993).

Other factors

Smoking or alcohol intake

Several studies about compliance among asthma, hypertension and renal transplantation patients found that patients who smoked or drank alcohol were more likely to be non-compliant (Degoulet et al 1983; Shea et al 1992; Turner et al 1995; Leggat et al 1998; Kyngas 1999; Kyngas and Lahdenpera 1999; Kiortsis et al 2000; Kim et al 2002; Ghods and Nasrollahzadeh 2003; Yavuz et al 2004; Balbay et al 2005; Cooper et al 2005; Fodor et al 2005). In a study conducted in Finland in hypertension patients, non-smokers were more compliant to the diet restrictions (Kyngas and Lahdenpera 1999). Likewise, another study in renal transplantation patients in Turkey found that patients who were smoking or drinking were unlikely to be compliant to the therapy (Yavuz et al 2004). Only one single study about obstructive sleep apnoea/hypopnoea syndrome (OSAHS) found no relationship between smoking or alcohol intake and patient's compliance with continuous positive airway pressure treatment (Wild et al 2004).

Forgetfulness

Forgetfulness is a widely reported factor that causes non-compliance with medication or clinic appointments (Cummings et al 1982; Kelloway et al 1994; Okuno et al 2001; Hernandez-Ronquillo et al 2003; Ponnusankar et al 2004; Wai et al 2005). A Japanese study in elderly home-care recipients found an interesting association between meal frequency and compliance. Patients having less than 3 meals per day were less compliant than patients having 3 meals a day. It suggested that meal frequency was an effective tool to remind the patient to take drugs (Okuno et al 1999). As mentioned in a previous section, written instructions are better than oral advice for reminding patients to take medication.

Therapy-related factors

Therapy-related factors identified include: route of administration, treatment complexity, duration of treatment period, medication side effects, degree of behavioral change required, taste of medication and requirement for drug storage (Table 4).

Route of administration

Medications with a convenient way of administration (eg, oral medication) are likely to make patients compliant. Studies in asthma patients compared compliance between oral and inhaled asthma medications, and found patients had better compliance with oral medication (Kelloway et al 1994; Nichols-English and Poirier 2000). Likewise, difficulty in using inhalers contributes to non-compliance in patients with asthma (Bender and Bender 2005).

Treatment complexity

Complex treatment is believed to threaten the patient's compliance. However, compliance does not seem to correlate with the number of drugs prescribed (Horne and Weinman 1999; Patal and Taylor 2002; Grant et al 2003; Iihara et al 2004), but the number of dosing times every day of all prescribed medications (Kass et al 1986; Cockburn et al 1987; Cramer et al 1989; Eisen et al 1990; Cramer 1998; Sung et al 1998; Claxton et al 2001; Iskedjian et al 2002). The rate of compliance decreased as the number of daily doses increased. This is illustrated by one study where compliance was assessed by pill counts and self-reports that showed that non-compliance increased with an increase in the frequency of prescribed dosing: 20% for once daily; 30%

Table 4 The effect of therapy-related factors on compliance

Factor	Reference		
	Increased compliance	Decreased compliance	No effect
Convenient route of medication administration	Kelloway et al 1994; Nichols-English and Poirier 2000		
Increasing number of medications taken	Buck et al 1997; Fodor et al 2005	Murray et al 1986; Kiortsis et al 2000	Horne and Weinman 1999; Patal and Taylor 2002; Grant et al 2003; Iihara et al 2004
Increasing number of dosing times		Kass et al 1986; Cockburn et al 1987; Cramer et al 1989; Eisen et al 1990; Cramer 1998; Sung et al 1998; Claxton et al 2001; Iskedjian et al 2002	
Long duration of treatment period	Sharkness and Snow 1992; Garay-Sevilla et al 1995	International Union Against Tuberculosis 1982; Combs et al 1987; Menzies et al 1993; Farmer et al 1994; Frazier et al 1994; Ghods and Nasrollahzadeh 2003; Gascon et al 2004; Dhanireddy et al 2005	
Medication side effect		Spagnoli et al 1989; Shaw et al 1995; Buck et al 1997; Dusing et al 1998; Hungin 1999; Kiortsis et al 2000; Linden et al 2000; Kim et al 2002; Dietrich et al 2003; Grant et al 2003; Loffler et al 2003; Sleath et al 2003; Iihara et al 2004; Kaplan et al 2004; Ponnusankar et al 2004; O'Donoghue 2004	
High degree of behavior changed required		Milas et al 1995; Hernandez-Ronquillo et al 2003; Vincze et al 2004	
Bad taste of the medication		O'Donoghue 2004	
Inconvenient requirement for drug storage		O'Donoghue 2004	

for twice daily; 60% for three times a day; and 70% for four times daily (Cramer et al 1989). Similarly, a meta-analysis found that there was a significant difference in compliance rate between patients taking antihypertensive medication once daily and twice daily (92.1% and 88.9%, respectively) (Iskedjian et al 2002). Thus, simplifying the medication dosing frequency could improve compliance markedly.

Duration of the treatment period

Acute illnesses are associated with higher compliance than chronic illnesses (Gascon et al 2004). In addition, longer duration of the disease may adversely affect compliance (Farmer et al 1994; Frazier et al 1994). Similarly, a longer duration of treatment period might also compromise patient's compliance (Menzies et al 1993; Ghods and Nasrollahzadeh

2003; Dhanireddy et al 2005). In one trial that compared 6-month and 9-month treatment of tuberculosis, compliance rates were 60% and 50% for the two regimens, respectively (Combs et al 1987). In another study comparing preventive regimens of 3, 6 and 12 months, compliance rates were 87%, 78% and 68% for the three regimens, respectively (International Union Against Tuberculosis 1982).

However, some studies about chronic diseases found that longer duration of the disease resulted in good compliance (Sharkness and Snow 1992; Garay-Sevilla et al 1995), and newly diagnosed patients had poor compliance (Caro et al 1999). This may indicate that compliance is improved because patient's attitude of denying the disease is reduced and they accepted treatment after years of suffering from the disease.

Medication side effects

All of the seventeen studies on side effects factor found that side effects threaten patient's compliance (Spagnoli et al 1989; Shaw et al 1995; Buck et al 1997; Dusing et al 1998; Hungin 1999; Kiortsis et al 2000; Linden et al 2000; Kim et al 2002; Dietrich et al 2003; Grant et al 2003; Loffler et al 2003; Sleath et al 2003; Iihara et al 2004; Kaplan et al 2004; Ponnusankar et al 2004; O'Donoghue 2004). In a German study, the second most common reason for non-compliance with antihypertensive therapy was adverse effects (Dusing et al 1998). The effect of side effects on compliance may be explained in terms of physical discomfort, skepticism about the efficacy of the medication, and decreasing the trust in physicians (Christensen 1978).

Degree of behavioral change required

The degree of required behavioral change is related to patients' motivation to be compliant with the therapy (Milas et al 1995; Hernandez-Ronquillo et al 2003; Vincze et al 2004). A study done in Mexico demonstrated that patients with type 2 diabetes could not follow the diet because of the difficulty of changing their dietary habits (Hernandez-Ronquillo et al 2003).

Social and economic factors

Social and economic factors include: time commitment, cost of therapy, income and social support.

Time commitment

Patients may not be able to take time off work for treatment; as a result, their rate of compliance could be threatened (Shaw et al 1995; Siegal and Greenstein 1999; Hernandez-Ronquillo et al 2003; Lawson et al 2005; Neal et al 2005). Therefore, a shorter traveling time between residence and healthcare facilities could enhance patient's compliance (Gonzalez et al 2005). A study suggested that white collar patients have poor compliance because they have other priorities (Siegal and Greenstein 1999). Housewives with tuberculosis were more compliant to therapy in an observational study in Malaysia (Chuah 1991). This may be because housewives can adapt well to clinic appointment times and treatment.

Cost of therapy and income

Cost is a crucial issue in patient's compliance especially for patients with chronic disease as the treatment period could be life-long (Connelly 1984; Shaw et al 1995; Ellis et al 2004; Ponnusankar et al 2004). Healthcare expenditure could be a large portion of living expenses for patients suffering from chronic disease. Cost and income are two interrelated factors. Healthcare cost should not be a big burden if the patient has a relatively high income or health insurance. A number of studies found that patients who had no insurance cover (Swett and Noones 1989; Kaplan et al 2004; Choi-Kwon 2005), or who had low income (Degoulet et al 1983; Cockburn et al 1987; Shea et al 1992; Frazier et al 1994; Apter et al 1998; Berghofer et al 2002; Benner et al 2002; Ghods and Nasrollahzadeh 2003; Hernandez-Ronquillo et al 2003; Mishra et al 2005) were more likely to be non-compliant to treatment. However, even for patients with health insurance, health expenses could still be a problem. More than one in ten seniors in the USA reported using less of their required medications because of cost (Congressional Budget Office 2003). Nevertheless, in other cases, income was not related to compliance level (Norman et al 1985; Lim and Ngah 1991; Patal and Taylor 2002; Stilley et al 2004; Wai et al 2005). In Singapore, a study on chronic hepatitis B surveillance found that monthly income was not related to patient's compliance with regular surveillance (Wai et al 2005). This discrepancy might due to different healthcare systems in different countries. Healthcare personnel should be aware of patient's economic situation and help them use medication more cost-effectively.

Social support

The general findings from these articles showed that patients who had emotional support and help from family members, friends or healthcare providers were more likely to be compliant to the treatment (Stanton 1987; Lorenc and Branthwaite 1993; Garay-Sevilla et al 1995; Milas et al 1995; Kyngas 1999; Okuno et al 1999; Stromberg et al 1999; Kyngas 2001; Kyngas and Rissanen 2001; Thomas et al 2001; Loffler et al

2003; DiMatteo 2004; Feinstein et al 2005; Seo and Min 2005; Voils et al 2005). The social support helps patients in reducing negative attitudes to treatment, having motivation and remembering to implement the treatment as well.

Healthcare system factors

The main factor identified relating to healthcare systems include availability and accessibility. Lack of accessibility to healthcare (Ponnusankar et al 2004), long waiting time for clinic visits (Grunebaum et al 1996; Balkrishnan et al 2003; Moore et al 2004; Lawson et al 2005; Wai et al 2005), difficulty in getting prescriptions filled (Cummings et al 1982; Vlasnik et al 2005), and unhappy or unsatisfied clinic visits (Spikmans et al 2003; Gascon et al 2004; Lawson et al 2005) all contributed to poor compliance. The above observation is further supported by another study that showed patient's satisfaction with clinic visits is most likely to improve their compliance with the treatment (Haynes et al 1980).

Disease factor

Patients who are suffering from diseases with fluctuation or absence of symptoms (at least at the initial phase), such as asthma and hypertension, might have a poor compliance (Hungin 1999; Kyngas and Lahdenpera 1999; Vlasnik et al 2005). Kyngas and Lahdenpera demonstrated that there was a significant relationship between the presence of hypertension symptoms and reduction in the sodium consumption. Seventy-one percent of the patients who had symptoms reduced the use of sodium, as compared to only 7% of the patients who did not suffer from symptoms (Kyngas and Lahdenpera 1999). Patients who had marked improvement in symptoms with the help of treatment normally had better compliance (Lim et al 1992; Viller et al 1999; Grant et al 2003).

In addition, no consistent evidence shows that subjects with greater disease severity based on clinical evaluation comply better with medications than healthier ones (Matthews and Hingson 1977; Kyngas 1999; Wild et al 2004; Seo and Min 2005). A study in patients with OSAHS found that greater disease severity based on clinical variables predicted better compliance (Wild et al 2004). However, a study on compliance in adolescents with asthma showed that only patients with mild severity had good compliance (Kyngas 1999). Similarly, Matthews et al suggested that the actual severity of the illness (based on the physician's clinical evaluation) was not related to compliance (Matthews and Hingson 1977). Instead of actual disease severity, perceived health status may have more significant influence on compliance. Patients expecting poor health status are more motivated to be compliant with treatment if they consider the medication to be effective (Rosenstock et al 1988). In a study conducted in the USA in patients on antihyperlipidemic medications, patients with a perception of poor health status were more compliant with treatment (Sung et al 1998). This supports the suggestion that how patients feel plays a crucial role in predicting compliance.

Discussion

From the literature review, it can be concluded that although several terms have been used, the terms are used more or less interchangeably in clinical practice and therefore, the definition of compliance is adequately defined in the practical context. However, one alarming observation is that non-compliance remains a major issue in enhancing healthcare outcomes in spite of the many studies highlighting the problem over the years.

In this review we attempted to identify factors related to compliance which would have wide generalizability, and we retrieved original studies investigating non-compliance from different diseases, population settings and different countries. In the process, we identified a wide array of influencing factors. Although some factors' effect on compliance is complex and not unequivocal, several factors with consistent impact on compliance have been identified through the review process.

Firstly, addressing therapy-related factors should contribute positively in improving patient's compliance. Prescribing medication with non-invasive route of administration (eg, oral medication) and simple dosing regimens might motivate patients to be compliant. Long duration of treatment period and medication side effects might compromise patient's beliefs about medication effectiveness. Therefore, healthcare providers should consider therapy-related problems when designing the therapy plan and involve the patients in the process to minimize the possible therapeutic barriers.

Besides therapy-related factors, healthcare system problems were found to be significantly related to compliance. Accessibility and satisfaction with the healthcare facilities are important contributors to compliance because patient's satisfaction with healthcare is crucial for their compliance. Long waiting time for clinic visits and unhappy experience during clinic visits was indicated by many studies. A healthcare system designed with convenient accessibility and patient satisfaction in mind would be a great help for compliance issue.

Thirdly, compliance is also related with disease characteristics. Non-compliance is usually not a prevalent issue in acute illness or illness of short duration. In contrast, patients who are suffering from chronic diseases, in particular those with fluctuation or absence of symptoms (eg, asthma and hypertension) are likely to be non-compliant. Special efforts and attention should be paid to address the issue of non-compliance in chronic disease patients.

Lastly, healthcare expenditure is a very important factor for patients with chronic diseases because the treatment could be life-long so the cost of therapy would constitute a large portion of their disposable income. If the patient feels that the cost of therapy is a financial burden, the compliance with therapy will definitely be threatened. Healthcare personnel should be aware of patient's economic situation during the planning of a treatment regimen, and a healthcare finance system that provides at least some financial assistance to low income patients would be helpful to boost compliance.

These factors discussed so far are directly and clearly related to patient's compliance. We can call them the "hard" factors. We are using this term as the impact of factors identified is more quantifiable. By and large, these "hard" factors are amendable to a certain extent by counseling and communication by healthcare providers. In additional, the society could also participate in minimizing the barriers for patients to follow the therapy.

In contrast with "hard" factors, some other factors might be classified as "soft" factors because their effects are much more difficult to measure and counter. In fact, a failure to address the "soft" factors may negate all efforts spent in countering the effects of the "hard" factors.

Psycho-social factors such as patient's beliefs, attitude towards therapy and their motivation to the therapy could be classified as "soft" factors. Since the 1990's, research has focused more on the patient-provider relationship and patients' beliefs about the therapies. For patients with chronic diseases, they would do their own cost-benefit analysis of therapy, either consciously or subconsciously. It means they weigh the benefits from compliance with therapy (ie, controlling symptoms and preventing medical complications) against constraints on their daily lives and perceived risks of therapy such as side effects, time and effort involved (Donovan and Blake 1992). Sometimes, they may have the wrong beliefs based on inadequate health knowledge or a negative relationship with the healthcare provider. Hence, patients should be given adequate knowledge about the purpose of the therapy and consequences of non-compliance. In addition, a healthy relationship and effective communication between the patient and healthcare provider would enhance patient's compliance. In fact, the effects of patient's beliefs, health knowledge and relationship with the healthcare provider are very complex because these "soft" factors are inter-related with each other. The interaction is a bit like antibiotic combinations. Sometimes the effect would be additive or synergistic, while other times the effect would be antagonistic. However, due to the design of the studies performed so far, it is difficult, if not impossible, to differentiate precisely whether the interaction between these factors would be additive, synergistic or antagonistic. More robust and better designed studies would be needed in future to elucidate this effect.

Similar to the "soft" factors, the effect of demographic factors (eg, age, gender, ethnicity, educational level and marital status) on compliance is also rather complicated, because they may not be truly independent factors influencing compliance. Actually, demographic factors are related to patient's various cultural, socioeconomic and psychological backgrounds. Thus, future studies on compliance should not focus on demographic factors alone.

Definitely, there are some limitations in the current review. Firstly, only one electronic database, PubMed, was searched and only English articles were included. It might be possible that some informative studies in other literature databases or in other languages were omitted. Secondly, there is a shortcoming in the search strategy in that only articles with abstracts were retrieved. There are quite a number of studies published in 1970s and early 1980s without abstracts that were not screened. However, we do believe that the review so far has captured most of the key factors with potential influence on therapeutic compliance from the patient's perspective.

In conclusion, from the review of the literature starting from the 1970s to identify relevant factors relating to therapeutic compliance, the evidence indicates that non-compliance is still commonplace in healthcare and no substantial change occurred despite the large number of studies attempting to address and highlight the problem. In addition, too few studies are being done systematically to quantify the impact of non-compliance on health and financial outcomes. The magnitude of the impact of non-compliance needs to be studied in future compliance research due to the potential tremendous implication of poor compliance on clinical and economic outcomes. Finally, few studies on compliance have been performed in Asian and developing countries where most of the world's population resides. More studies on factors influencing

compliance in these countries or regions would be helpful to fill in the knowledge gap and contribute to formulating international strategies for countering non-compliance.

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Is Mastectomy Overused? A Call for an Expanded Research Agenda

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Surgery is the cornerstone of definitive treatment for most women with breast cancer. By the mid-1980s, several randomized trials had demonstrated that lumpectomy with radiation therapy confers the same survival benefit as modified radical mastectomy for women without metastatic disease (Fisher, Bauer, Margolese, et al. 1985; National Institutes of Health 1990). Since that time, clinicians, researchers, patients, and women's health advocates have voiced numerous concerns regarding women's experiences with breast cancer surgery. A primary concern in both clinical medicine and public discourse is that, given that there are two surgical alternatives, mastectomy is overused.

There have been several "framings" or definitions of problems regarding breast cancer surgical treatment over the past 2 decades. Early discussions of problems or controversies in breast cancer treatment focused on the issue of patient informed consent (Montini 1997; Nayfield, Bongiovanni, Alciati, et al. 1994). Media attention given to women who had awakened from a diagnostic biopsy to find that their breast had been removed fueled public outcry. Concerns about breast cancer surgeons' disregard for informed consent requirements were coupled with perceptions that there was an unusual slowness to the acceptance and dissemination of lumpectomy with radiation therapy as an appropriate surgical alternative to mastectomy (Montini 1997).

More recent research and discussion regarding breast cancer surgical treatment have centered around the fact that mastectomy remains the most common surgical approach in many geographic regions and patient subgroups. Patient advocacy groups, along with some clinicians and policymakers, have argued that too many women receive mastectomies. Breast conserving surgery (BCS) with radiation is perceived as a superior surgical choice for most women because it is less invasive, preserves the breast, and may thus serve to reduce body image concerns, sexual functioning problems, and/or other psychosocial sequela postsurgery. There is some empirical evidence suggesting that postsurgical psychological adjustment may be less difficult for women receiving BCS (Levy, Herberman, Lee, et al. 1989; Margolis, Goodman, Rubin, et al. 1989; Schain, Findlay, D'Angelo, et al. 1985). In a meta-analysis, Moyer (1997) found small advantages for BCS in regard to postsurgical psychological, marital, and sexual adjustment.

Not all studies, however, support the premise that postsurgical quality of life is better for women receiving BCS compared with mastectomy (Ganz, Schag, Lee, et al. 1992; Irwig and Bennetts 1997). The surgical approaches may be equivalent in terms of adjustment to or satisfaction with the surgery. Even so, some argue that equivalence should not be construed as justification for a higher use of mastectomy (Page and Jensen 1996; Starreveld 1997). If the treatments are truly equal, then policies and practices should emphasize the use of BCS. Indeed, the National Cancer Institute Consensus Development Conference on the treatment of early stage breast cancer declared that although the treatments are equivalent in most respects, BCS is preferable because it preserves the breast (National Institutes of Health 1990).

Based on this literature, researchers have largely focused on the relative use of the two procedures as measures of progress and quality of care. The results of this research suggest that the use of BCS increased slowly and minimally in many areas while stagnating in others (Farrow, Hunt, and Samet 1992; Lazovich et al. 1991; Samet, Hunt, and Farrow 1994). In addition, mastectomy remains the most common surgical treatment for breast cancer patients in many regions. Lazovich, Solomon, Thomas, et al. (1999) reported that for stage I breast cancer during 1995, the rate of BCS ranged from 41% to 71% across Surveillance, Epidemiology, and End Results (SEER) tumor registries. For stage II patients, mastectomy was the most common surgical approach in all SEER regions. These findings, coupled with the fact that breast cancer surgical treatment also varies by provider/hospital characteristics and patient sociodemographics (such as age, race and socioeconomic characteristics), are viewed as evidence that problems still exist in terms of the overuse of mastectomy (Michalski and Nattinger 1997; Morris et al. 2000; National Cancer Policy Board 1999; Nattinger, Gottlieb, Hoffman, et al. 1996; Nattinger, Gottlieb, Veum, et al. 1992).

Research has also demonstrated that BCS with radiation therapy affords the same survival rate as mastectomy for women with ductal carcinoma in situ, some of whom are perceived as optimal candidates for breast conservation (Boyages, Delaney, and Taylor 1999; Fisher, Dignam, Tan-Chiu, et al. 1999; Silverstein 1998). However, modified radical mastectomy remains the most

common surgical treatment for women with in situ breast cancer in several population-based tumor registry areas, a fact that is viewed as additional evidence that BCS is underutilized (Ernster, Barclay, Kerlikowske, et al. 1996; Morrow 1996; Talamonti 1996; Winchester et al. 1995).

Concerns about overtreatment with mastectomy and lack of patient informed consent, voiced primarily by women's health advocacy groups and some clinicians/researchers, motivated the passage of legislative mandates regarding breast cancer treatment in 20 states between 1979 and 1999 (Montini 1997; Nayfield, Bongiovanni, Alciati, et al. 1994). Almost all of these laws require that information regarding surgical treatment alternatives be provided to breast cancer patients in an informative and unbiased fashion. Nattinger, Hoffman, Shapiro, et al. (1996), using SEER trend data to estimate the impact of these legislative mandates, observed an increase in the rate of BCS that was slightly above expected in three of four SEER sites after a law was passed. However, within a year, BCS rates in all sites reverted to the expected levels. These results—using BCS rates as the litmus test—suggest that breast cancer treatment disclosure laws have had only a small, transient effect on breast cancer surgery in practice.

Breast Cancer Quality of Care Research: Widening the Lens to Consider Process

Go to:

Although most health services researchers would agree that assessments of medical care quality should focus on more than just outcomes or utilization patterns, a tacit assumption in many discussions of trends and patterns in breast cancer surgery is that BCS rates are a valid indicator of clinical progress, policy impact, and quality of care. It is not just researchers who are using rates of BCS as an important indicator. Some clinical institutions are promoting their own rates of BCS as a measure of the quality and progressiveness of care provided to breast cancer patients (e.g., see Cleveland Clinic Web site at www.ccf.org/quality/08-27/08-27j.htm).

It might be the case that mastectomy is overused in the United States. However, we argue that focusing on the single end point of the relative rate of mastectomy versus BCS does not address the most salient issues regarding breast cancer surgical treatment. Importantly, there is no reason to assume that BCS would be the predominant surgical choice if all women were fully informed of the surgical options in a nonbiased fashion. One can argue, with a wealth of data in hand, that the surgical treatments are equivalent in terms of survival. However, there are some significant differences between the two approaches that are likely to be perceived and weighed differently by individual women.

One obvious difference between the two procedures is that there are more contraindications for lumpectomy with radiation therapy than there are for mastectomy (e.g., multifocal disease), although the larger number of contraindications for BCS does not explain the higher use of mastectomy (Morrow, Bucci, and Rademake 1998). Another difference between the two procedures is cost: BCS with a full course of radiation therapy costs more than mastectomy, although when the cost of breast reconstruction is added to the cost of mastectomy, this treatment path becomes significantly more expensive (Desch, Penberthy, and Hillner 1999; Norum, Olsen, and Wist 1997).

More importantly, a key difference between the two surgical approaches is the rate of disease recurrence in the primary breast. Although recurrence is possible after both mastectomy and BCS, many studies have found that the local recurrence rate after BCS is higher than that for mastectomy, even among those who receive a full course of radiation therapy (Cox, Pendas, Ku, et al. 1998; Dalberg, Mattsson, Rutqvist, et al. 1997; Fowble 1999; Margolese 1999). Even for women with ductal carcinoma in situ, the risk of local recurrence after lumpectomy is estimated to be higher than that for mastectomy, with many recurrences involving invasive disease (Boyages, Delaney, and Taylor 1999; Fisher, Dignam, Tan-Chiu, et al. 1999; Silverstein 1998). Fear of recurrence is an important and salient issue for many women in deciding between surgical treatment alternatives, especially those women who are risk averse regarding their health.

In addition, the decision to receive BCS most often involves the decision to receive a several-week course of radiation therapy as well. There are many reasons (in addition to cost) that some women do not want to undergo radiation, including cognitive, emotional, and logistical factors. Fears regarding exposure to radiation and concerns about the travel distance and other logistical burdens associated with radiation therapy are important predictors of surgical treatment choice, especially in rural areas (Stafford, Szczys, Becker, et al. 1998). As such, higher rates of mastectomy in some geographic areas or patient subpopulations may in part reflect challenges regarding access to and completion of radiation therapy rather than serving as a marker for less progressive physicians and/or lower quality of care.

Another reason that focusing on the relative rates of mastectomy versus BCS is limited is because it neglects the importance of both *process* and *outcome* measures salient to quality of care. The type of surgery received is but one of several components in a decision-making process involving both patients and their providers (most notably surgeons). Focusing on the relative rate of mastectomy versus BCS emphasizes one easily observable end result, yet it fails to consider other salient and interrelated processes and outcomes. This includes women's attitudes and preferences regarding different treatment options, women's satisfaction with the surgery decision-making process, women's satisfaction with the surgery received, and postsurgical health-related quality of life.

Several studies have shown that patient preferences partly explain variations in surgical treatment patterns. In a recent multicenter study of breast cancer treatment among older women, Mandelblatt, Hadley, Kerner et al. (2000) collected information from older breast cancer patients and surgeons as well as from patient charts. With information on patient

preference, these researchers found a positive association between a desire to have no further treatment beyond surgery (i.e., no radiation) and mastectomy and a positive association between concerns about body image and BCS. However, it is also important to consider patient satisfaction with the decision-making process and with the surgery received to identify and fully understand any problems associated with breast cancer surgical choice.

A recent literature review of the information needs and preferences of women with breast cancer found that patients and their family members are often dissatisfied with the information they receive (Rees and Bath 2000). In addition, several studies have found that breast cancer patients who did not perceive that they had a surgery choice had a higher number of psychosocial adjustment issues postsurgery, regardless of surgery type (Bilodeau and Degner 1996; Degner, Krisjanson, Bowman, et al. 1997; Gafni, Charles, and Whelan 1998). Kiebert, de Haes, and van de Velde (1991) reviewed the literature and found that whether or not breast cancer patients took part in the treatment decision-making process was significantly associated with postsurgical quality of life issues, mostly those regarding body image. Several other studies have found that breast cancer patients who were given a choice between surgical treatments had less depression and anxiety than those who were not given a choice, even among those who deferred the decision to their surgeon or another provider (Fallowfield, Hall, Maguire, et al. 1990; Kaplan, Greenfield, and Ware 1989; Street and Voigt 1997). Thus, a growing body of research suggests that *having a choice* between surgical treatments, rather than the specific surgery type itself, is a critical factor in postsurgical satisfaction and adjustment for women with breast cancer.

There is indeed evidence that many physicians do not believe that BCS is as effective as mastectomy and that many breast cancer patients are not given a choice among surgical treatments (Ganz 1992; Tarbox, Rockwood, and Abernathy 1992). However, we challenge the blanket assumption that most women, even if fully informed about surgical options, would embrace BCS as the optimal choice, as there are several reasons that individual women might actually prefer a mastectomy. Variations in the rate of BCS are primarily interpreted as evidence of problems in the structure and process of surgical care (National Cancer Policy Board 1999). However, geographic and subgroup variations also may reflect in part differences in women's preferences and choices regarding surgical treatment. Thus, researchers need to move away from a primary focus on rates of mastectomy versus BCS, widening the research lens to view the degree to which women are being fully informed about surgical treatment options, whether and how they contribute to the decision-making process, and how these process measures are associated with patient satisfaction and quality of life.

Involving Patients in Treatment Decisions

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Although the importance of patient involvement in breast cancer treatment decisions has become more widely recognized, researching women's preferences regarding participation and control in medical decision making is far from easy. Prior studies on patient participation in complex medical decisions have found substantial variation regarding their preferred degree of control or involvement in clinical decisions. In a small study of breast cancer patients, Pierce (1993, 1996) categorized women into different types of decision makers and found that 40 percent were "deferrers," that is, women who wanted a decision made quickly, did not want additional information, and preferred to follow their physicians' recommendation. Similarly, Degner, Krisjanson, Bowman, et al. (1997) found that approximately one half of breast cancer patients wanted someone else to make the surgery decision for them or preferred to play a passive role in the process. Many patients prefer strong guidance and assistance when making complicated medical decisions, especially in the midst of a medical crisis (Schneider 1995). In general, older patients and those with lower levels of education are more likely to prefer a passive role in medical decision making.

Such findings, however, should not be overinterpreted or taken as evidence that the notion of patient participation in medical decisions is a privileged concept that does not apply to a significant proportion of patients. As Guadagnoli and Ward (1998) concluded, "Patient participation in decision making is justified on humane grounds alone and that physicians should endeavor to engage patients in decision making, albeit at varying degrees, when more than one effective treatment option exists," as is the case regarding breast cancer surgery for many women. Charles, Gafni, and Whelan (1997) argue that a "shared decision-making model" is preferable to an "informed model," where the patient makes the decision and the physician's role is one of information transfer and to a "paternalistic model" where the patient is left outside of the decision-making process, even if this is the patient's preference.

What do we know about breast cancer patients' experiences with the surgical treatment decision-making process? The results that are available at this time are limited because most studies in this area are based on small samples of convenience from large academic medical institutions. The available information, however, does suggest that we have some reasons to be concerned. Guadagnoli and Ward (1998) found that up to one quarter of breast cancer patients receiving mastectomy did not receive any information on BCS. Other researchers have concluded that many breast cancer patients who want "collaborative roles" in treatment decision making have difficulty achieving this (Bilodeau and Degner 1996; Pierce 1996). In one study, only 42 percent of women with breast cancer believed they had achieved their preferred level of control in the decision-making process (Street, Voigt, Geyer, et al. 1995).

In addition, the results of our own population-based study of 183 women diagnosed in 1998 with nonmetastatic breast cancer raise several concerns regarding the surgical treatment decision-making process (Katz, Lantz, and Zemencuk 2001). This study combined data from the SEER tumor registry for the Detroit metropolitan area, a short telephone interview, and a mailed survey (with a 71 percent response rate, completed by 90 percent of participants within 6 months of diagnosis). Overall, 54

percent of women in the sample received mastectomy, with no differences in surgery type between women with invasive and noninvasive disease. We also found that fully one third (33 percent) of the women did not perceive that they were given a choice between surgery types. This included some women (14 percent of the total sample) who perceived that they were told they had to have BCS (i.e., mastectomy was not an option) even though they had no reported contraindications for mastectomy. Knowledge regarding the similarities and differences between the two procedures was very low in this sample, even among women who perceived making a surgical treatment choice. In addition, consistent with prior studies, women who perceived less participation in the treatment decision-making process were significantly less satisfied (i.e., only 63 percent of those who did not perceive a surgery choice reported being involved in the decision to the degree that they wanted versus 91 percent of those who perceived making a choice, $p < 0.05$).

The fact that the rates of BCS versus mastectomy were about the same in this population-based sample (even among women with ductal carcinoma in situ) is alone insufficient evidence to support claims of overtreatment. However, when information on patient knowledge and preferences/satisfaction regarding the decision-making process is factored in, the results of this study suggest that there are indeed some areas of concern in the surgical treatment of these breast cancer patients. The high rate at which women did not perceive surgical choice conflicts with state law regarding treatment alternative disclosure and suggests a process in which patient preferences and values are not fully considered. These results underscore the important point that breast cancer patients' experiences and satisfaction with the process by which a treatment decision is made are of critical import.

Conclusions

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Breast cancer surgery is a complex issue from both a clinical and a health services research perspective. However, when public and scholarly discourse includes overt claims or even subtle suggestions that variation in mastectomy rates reflects overtreatment and poor quality of care, the result is the reduction of this complex issue to the sound bite that "mastectomy is bad, and lumpectomy is good." We need to avoid blanket labeling of mastectomy as a less progressive treatment for breast cancer, even among women with early stage disease. Mastectomy is a viable surgical outcome that affords a reduced risk of recurrence in the primary breast and—for most patients—means that they do not have to undergo radiation therapy. For some patients, this reduced risk is of greater importance than preserving their body image by avoiding mastectomy. In addition, for some women, breast reconstruction can reduce some of the negative psychosocial sequela of losing a breast. Rates, trends, and patterns in the mastectomy rate in a population or its subgroups do not in and of themselves provide evidence of misinformation or malfeasance on the part of clinicians. In fact, for women with no contraindications to either procedure, we should be just as concerned about women who are only offered BCS by their surgeons as we have been about those who are only offered mastectomy.

Others have called for an expanded approach to looking at quality of care issues among breast cancer patients (Mandelblatt, Ganz, and Kahn 1999; Mandelblatt, Hadley, Kerner, et al. 2000; National Cancer Policy Board 1999). In 1992, Ganz wrote that "[a]lthough breast-conserving surgery has been recommended for the majority of women with breast cancer in an early stage, the ideal rate of breast-conserving surgery is unknown." As Ganz further suggested, we need to find out if underuse of BCS is driven more by surgeons' attitudes and behaviors than by patient preferences and choice. This search necessarily brings us beyond studies of variation or patterns in surgical treatment rates. However, what researchers should focus on instead has remained less clear.

We propose the following research agenda to advance knowledge regarding breast cancer surgical treatment decisions. First, we need to continue research and surveillance regarding trends, patterns, and subgroup variation in breast cancer surgery outcomes, comparing the rates of mastectomy and BCS. This type of work, which primarily uses data from population-based tumor registries, is critical to our understanding of clinical practice in this important area of women's health, and needs to continue.

Second, however, we also need more population-based research on surgery decision making and on the extent and nature of problems with the surgical choice process. Much work has already been done in these areas, but the bulk of it was conducted using small convenience samples of middle-class women. Continued attention to the factors associated with surgical treatment type is needed. Simultaneously, however, an expanded focus is needed in regard to patient and provider perceptions of the decision-making process and the degree to which the surgical treatment decision-making process matches the preferences and decision style of the patient. Designing studies that assess the perspectives and experiences of both patients and their providers is essential. Although much of this work will necessarily be retrospective, there is a role for direct observation (for instance, through audio or video recording) of treatment encounters that can shed valuable light on how patients and providers recall and appraise these events. Admittedly, this type of research is limited by logistical and ethical considerations in requesting research participation from patients and their providers at a time of crisis.

Third, in addition to an enhanced focus on the process, we should also expand the outcomes under investigation beyond surgery type. Mandelblatt, Ganz, and Kahn (1999) recommended several potential outcome measures regarding quality of breast cancer care, including documentation of choice for treatment and documentation of patient participation in the treatment decisions. In addition, we recommend looking at patient satisfaction with the treatment choice and postsurgical quality of life as important outcomes that are potentially related to surgery type, but also may be related to the degree to which the decision-making

process matched patient preferences and abilities. Prior empirical work in these areas provides researchers with a good foundation from which to develop and test instruments (Aaronson, Ahmedzai, and Bergman 1993; Degner, Krisjanson, Bowman, et al. 1997; Fallowfield, Hall, Maguire, et al. 1990; Holmes-Rovner, Kroll, Schmitt, et al. 1996; Pierce 1996; Sprangers, Groenvold, and Arraras 1996; Street and Voigt 1997). A necessary focus of this type of research is how the quality of care varies across subpopulations defined by age, race, ethnicity, and socioeconomic status in order to explicate and understand social disparities in experiences and outcomes (Fiscella et al. 2000).

Finally, more interventions regarding decision support for breast cancer patients need to be designed and evaluated, such as those that Sepucha et al. (2000) and Whelan, Levine, Gafni, et al. (1999) described. Counseling or decision support interventions need to be tailored to individual patients' decision-making styles and their needs regarding additional knowledge, assistance, and support (Gafni, Charles, and Whelan 1998). No one particular approach or model for patient participation or shared decision making should be advocated. Rather, what is important is flexibility in the structure of the decision-making process so that individual differences and preferences are respected.

Is mastectomy overused in the United States? We believe that the answer to this important question is quite likely affirmative; that is, that the rate of mastectomy is high, not relative to the rate of BCS, but to the true preferences and desires of women with breast cancer. Focusing on the relative rate of mastectomy versus BCS gives us very little insight into the complex underlying issues and problems. Rather than limiting our research focus to the actual surgical procedures received, much more attention should be given to the process by which decisions about surgery are made and how this process is linked to more salient patient outcomes, such as quality of life and patient satisfaction. Although such research has substantial scientific challenges, it is critical to the advancement of clinical practice, public policy formation, and consumer advocacy work related to breast cancer treatment.

Footnotes

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RESEARCH Open Access

Surgical perspectives from a prospective, nonrandomized, multicenter study of breast conserving surgery and adjuvant electronic brachytherapy for the treatment of breast cancer

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Abstract

Background: Accelerated partial breast irradiation (APBI) may be used to deliver radiation to the tumor bed post-lumpectomy in eligible patients with breast cancer. Patient and tumor characteristics as well as the lumpectomy technique can influence patient eligibility for APBI. This report describes a lumpectomy procedure and examines patient, tumor, and surgical characteristics from a prospective, multicenter study of electronic brachytherapy.

Methods: The study enrolled 65 patients of age 45-84 years with ductal carcinoma or ductal carcinoma in situ, and 44 patients, who met the inclusion and exclusion criteria, were treated with APBI using the Axxent® electronic brachytherapy system following lumpectomy. The prescription dose was 34 Gy in 10 fractions over 5 days.

Results: The lumpectomy technique as described herein varied by site and patient characteristics. The balloon applicator was implanted by the surgeon (91%) or a radiation oncologist (9%) during or up to 61 days post-lumpectomy (mean 22 days). A lateral approach was most commonly used (59%) for insertion of the applicator followed by an incision site approach in 27% of cases, a medial approach in 5%, and an inferior approach in 7%. A trocar was used during applicator insertion in 27% of cases. Local anesthetic, sedation, both or neither were administered in 45%, 2%, 41% and 11% of cases, respectively, during applicator placement. The prescription dose was delivered in 42 of 44 treated patients.

Conclusions: Early stage breast cancer can be treated with breast conserving surgery and APBI using electronic brachytherapy. Treatment was well tolerated, and these early outcomes were similar to the early outcomes with iridium-based balloon brachytherapy.

Background

The treatment of breast cancer has advanced considerably in the last two decades due to earlier detection, improved techniques for staging, development of alternative surgical approaches and radiation technologies, and coordination of multidisciplinary teams to implement multi-faceted treatment programs [1,2]. With the shift from mastectomy to breast-conserving surgery has come the reliance on post-operative adjuvant radiation therapy as an integral part of the local treatment regimen to the breast [3-5]. However, studies have shown that some patients opt for a mastectomy rather than lose time from family or work traveling to a distant radiation facility and/or undergoing a lengthy radiation treatment such as with conventional whole breast irradiation (WBI) [6-9]. The development of several techniques of accelerated partial breast irradiation (APBI) provides an alternative to WBI that reduces treatment time from weeks to days [6,10-12].

APBI studies using multiple interstitial catheters to deliver fractionated radiotherapy have demonstrated good long-term control rates and cosmesis with an

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acceptable safety profile at up to 12 years of follow up [12-14]. The use of a single balloon catheter for APBI has demonstrated good control rates, cosmesis and safety at up to 5 years followup [15-17] The majority of APBI techniques require the use of an ^{192}Iridium source, which in turn requires a heavily-shielded radiation vault and a high dose rate (HDR) afterloader unit. These facilities are not present in many geographical areas of the United States due to the large capital expenditure [18]. An electronic X-ray source was developed as an alternative to the ^{192}Iridium source for APBI. The electronic brachytherapy (EBT) system (Axxent®, Xoft, Inc., Sunnyvale, CA) uses a miniature HDR electronic 50 kV X-ray source for intracavitary APBI in a minimally shielded environment [18-20]. The electronic source mimics an ^{192}Iridium source and provides an equivalent or higher dose rate with a steeper fall off of dose over distance [20].

In prospective studies of balloon-based APBI that enrolled patients prior to surgical implantation of the balloon applicator, approximately 30% of patients were ineligible for irradiation following implantation [20,21]. Nonconformance of the balloon to the lumpectomy cavity or inadequate margins between the balloon surface and the skin were the primary reasons for exclusion from brachytherapy treatment in both the ^{192}Iridium and EBT studies. This report examines surgical techniques used during implantation of the EBT balloon applicator and contains patient data from the first multicenter EBT study. The initial publication of this study focused on treatment outcomes and characteristics of treated patients and tumors omitting critical surgical aspects of the study [20]. Herein we evaluate characteristics of both the ineligible and the eligible patients, the complete listing of adverse events and data from patient questionnaires. This report also provides an illustrated lumpectomy procedure that details optimal design of the lumpectomy cavity and overlying skin bridge in preparation for EBT balloon applicator placement.

Methods

Overall results from the initial phase IV, prospective, multicenter, non-randomized EBT study were reported by Mehta, et al. [20], and the study methods were detailed in that publication. Data not presented in that paper regarding surgical details, characteristics of ineligible patients, adverse events, and patient questionnaires will be presented here, and the methods pertaining to those data are summarized below.

The study enrolled 65 patients at 10 study centers from March 2007 to March 2008. The Institutional Review Board at each of the 10 study sites approved the study protocol. The study was conducted in accordance with the Declaration of Helsinki and all applicable regulations. The patient selection criteria were based on the American Society of Breast Surgeons Consensus Statement for Accelerated Partial Breast Irradiation and the American Brachytherapy Society Breast Brachytherapy Task Group report [22,23]. Patients were initially screened for enrollment based on age (greater than 50 years), disease status (completely resected T1 invasive ductal cancer or ductal carcinoma in situ, less than 2 cm in diameter), availability for balloon applicator implantation within 5 weeks of their lumpectomy, and pathologically negative surgical margins on permanent section of at least 1 mm. Exclusion criteria included pregnancy, breast-feeding, a diagnosis of scleroderma, systemic sclerosis, active lupus, or a histological diagnosis of infiltrating lobular cancer. Each patient underwent informed consent prior to enrollment. After balloon applicator insertion, geometric conformance of the inflated balloon to the surgical cavity was verified using computerized tomography (CT) imaging as was a balloon surface to epidermal skin surface distance of at least 7 mm. Patients not meeting these criteria were excluded from treatment.

The EBT system was used to deliver intracavitary APBI to eligible patients. The EBT system uses an electronic, high dose rate, low energy (50 keV maximum energy) X-ray tube integrated into a flexible, multi-lumen catheter to deliver radiation. A sterile, disposable, single use balloon applicator functions as a guide for the X-ray source, and a mobile controller allows the X-ray source to be stepped within the balloon in order to tailor the radiation dose distribution to the tissue surrounding the balloon. A drainage system has been integrated into the Balloon Applicator to allow for suction of air or fluid from the lumpectomy cavity. The prescription dose delivered was 3.4 Gy twice daily for 5 days (10 fractions) to a distance of 1 cm beyond the balloon surface. Additional details about the system and treatment planning have been described in prior reports [18-20].

Patient and tumor characteristics were compared between groups of patients meeting all inclusion criteria and those ineligible for treatment. Factors affecting the success of implanting the balloon applicator and administering the prescribed radiation therapy were analyzed. Patients answered a questionnaire after implantation regarding their level of pain on a scale (normalized) from 0 (mild/none) to 6 (severe). Patients also answered a questionnaire post-treatment regarding their satisfaction with this radiation therapy on a scale from 0 (not satisfied) to 6 (very satisfied). Patient compliance with the APBI regimen and all study procedures was recorded. Adverse events were categorized by relationship to treatment and using the CTCAE 3.0 grading system [24]. Any recurrences and new cancers detected during the course of normal follow-up were recorded. Patients were evaluated at 1, 6 and 12 months and annually thereafter for up to 5 years.

Results

In this phase IV study, 65 patients gave informed consent and were fully evaluated for eligibility to participate in the study. The inclusion and exclusion criteria were met by 44/65 (68%) patients, and 21 (32%) patients exited the study without treatment. Reasons for ineligibility included inadequate skin to balloon surface distance in 13 patients, balloon-to-cavity nonconformance in 3, age under 50 years in 1 patient, spontaneous balloon deflation in 2 patients (leading to withdrawal from the study), a positive axillary lymph node in 1 patient, and a positive margin on permanent pathologic analysis in 1 patient. Patient characteristics of the eligible and ineligible groups are shown in Table 1, and tumor characteristics of both groups are shown in Table 2. The majority of patients were post-menopausal Caucasian women with no prior history of cancer and no family history of breast cancer. The study was initially designed to follow patients for 6 months. Six months of follow-up data have been collected for 43/44 (98%) patients, and 1 patient was lost to follow-up after the 3-month visit. The protocol was amended to follow patients annually for up to 5 years, and 36/44 patients consented to the follow up phase of the study. One-year data are available on 36 patients, with a median duration of follow up of 394 days.

Table 1 Patient Demographics at Baseline

	Treated Patients	Ineligible Patients	P-Value
Number of Patients	44	21	–
Age: mean (range)	64 years (45-84)	64 Years (48-83)	p = NS
Ethnicity: n (%)			
Caucasian	38 (86.4%)	19 (90.5%)	p = NS
African-American	5 (11.4%)	2 (9.5%)	
Asian	1 (2.3%)	0 (0.0%)	
Menopausal Status: n (%)			
Pre-Menopausal	1 (2.3%)	1 (4.8%)	p = NS
Peri-Menopausal	2 (4.6%)	1 (4.8%)	
Post-Menopausal	41 (93.2%)	19 (90.5%)	
Prior history of cancer: n (%)			
Yes	8 (18.2%)	3 (14.3%)	p = NS
No	36 (81.8%)	17 (81.0%)	
Not reported	0 (0.0%)	1 (4.8%)	
Familial History of Breast Cancer: n (%)			
No Family History	28 (64%)	14 (66.7%)	p = NS
First Degree Relative With Breast Cancer	13 (30%)	6 (28.6%)	
Second Degree Relative With Breast Cancer	4 (9%)	0 (0%)	

NS = not significant.

The implantation procedure was successful, and the eligibility criteria were met in 44 patients with 3 exceptions: two patients with tumors of > 2.0 cm and one who was under the age of 50 were allowed treatment. A majority of balloon applicators were placed by a surgeon (91%) in a procedure room of the surgeon's office (48%), an outpatient clinic (30%), an operating room (11%) or another location (11%). A radiation oncologist placed the balloons in 9% of patients. A lateral approach was most commonly used (59%) for insertion of the applicator followed by an incision site approach in 27% of cases, a medial approach in 5%, and an inferior approach in 7%. A trocar was used during applicator insertion in 27% of cases. The procedure lasted a mean of 32 minutes (range 4-150 minutes) and was done on average 22 days (range 0-61 days) after the lumpectomy. Of the 44 patients who underwent balloon applicator placement, local anesthetic and sedation were administered in 18 patients at the time of applicator placement, local anesthetic without sedation in 20 patients, and sedation only in 1 patient. Five patients were not given any local anesthetic or sedation during balloon applicator placement.

The size and shape of each balloon applicator was predicated to best fit the cavity geometry of each individual patient in order to provide uniform contact between the wall of the applicator and the resultant surgical cavity. The 4-5 cm spherical balloon applicator was implanted in 84% of patients, the 3-4 cm spherical balloon in 2%, the 5-6 cm spherical balloon in 9% and the 5 × 7 cm ellipsoidal balloon in 5%. The mean volume of fluid instilled was 56.5 cc (range 35-110 cc depending on balloon size). After CT scan, the initial volumes were adjusted to optimize balloon conformance to the lumpectomy cavity. The final adjusted balloon volume was a mean of 57.7 cc (range 21-125 cc). Balloon conformance was inadequate in 3 patients leading to exclusion from the study. In two of these three patients, the physician attempted to place the balloon applicator, and in one patient the cavity was assessed by ultrasound and determined to not be adequate for placement of a balloon applicator. The time interval from lumpectomy to balloon applicator placement or ultrasound assessment in these 3 patients was 15, 19 and 16 days.

Assessment of the balloon and measurement of the distance from balloon surface to skin surface was evaluated at the time of implantation as well as prior to the first treatment. The distance was found to be inadequate in 13 patients leading to exclusion from treatment. Mean distance from balloon surface to skin surface was 25.4 mm (median 15.0 mm, range 8-96 mm) in the 44 patients who received treatment. For patients who reported CTC grade 1 and grade 2 skin toxicities, such as erythema,

Table 2 Tumor Characteristics

	Treated (n = 44)	Ineligible (n = 21)	P-Value
Tumor Size: mean (range)	1.2 cm (0.2-2.8 cm)	1.2 cm (0.01-5.5 cm)	p = NS
Initial volume of excised tissue: mean (range)	63.6 cc (15-180 cc)	69.2 cc (35-144 cc)	p = NS
Excised volume after re-excision: mean (range)	32.6 cc (7-60 cc)	N/A	
Additional surgery to assure negative margins:			
Yes	9 (20.5%)	1 (4.8%)	
No	34 (77.3%)	20 (95.2%)	p = NS
Not reported or not applicable	1 (2.3%)	0 (0.0%)	
AJCC Class: n (%)			
Tis	12 (27.3%)	4 (19.1%)	
T1a	1 (2.3%)	3 (14.3%)	
T1b	8 (18.2%)	4 (19.1%)	
T1c	21 (47.7%)	8 (38.1%)	p = NS
T1mic	0 (0.0%)	1 (4.8%)	
T2	2 (4.6%)	0 (0.0%)	
Not reported	0 (0.0%)	1 (4.8%)	
Histopathologic Grade			
G1 Well Differentiated	12 (27.3%)	5 (23.8%)	
G2 Moderately Differentiated	18 (40.9%)	9 (42.9)%	
G3 Poorly Differentiated	10 (22.7%)	1 (4.8%)	p = NS
Grade Not Available	4 (9.1%)	5 (23.8%)	
Not reported	0 (0.0%)	1 (4.8%)	
Breast Cup Size			
B	12 (27.3%)	7 (33.3%)	
C	16 (36.4%)	4 (19.1%)	p = NS
D	11 (25.0%)	2 (9.5%)	
Not reported	5 (11.4%)	8 (38.1%)	
Lesion Location: Side			
Left Side	27 (61.4%)	14 (66.7%)	p = NS
Right Side	17 (38.6%)	7 (33.3%)	
Lesion Location: Vertical			
Upper	29 (65.9%)	14 (66.7%)	
Lower	10 (22.7%)	3 (14.3%)	p = NS
Midline	5 (11.4%)	4 (19.1%)	
Lesion Location: Horizontal			
Outer	26 (59.1%)	8 (38.1%)	
Inner	10 (22.7%)	6 (28.6%)	p = NS
Midline	8 (18.2%)	5 (23.8%)	
Not reported	0 (0.0%)	2 (9.5%)	

cc = cubic centimeters, cm = centimeters, NS = non-significant.

hypopigmentation, ecchymosis, and hyperpigmentation, the mean skin spacing assessed on CT prior to the first fraction was 14.8 mm (median 15.0 mm, range 6-28 mm).

The prescription dose was 34 Gy in 10 fractions over 5 days. The mean dwell times were 6.6, 7.8, 8.4, and 10.2 minutes in patients with a balloon size of 3-4 cm, 4-5 cm, 5-6 cm, and 5 × 7 cm, respectively [20].

Patients were asked to rate procedural pain on a scale of 1 (mild/none) to 6 (severe). In the 5 patients who did not receive local anesthetic or sedation during balloon applicator insertion, a mean score of 1.8 was tabulated. The mean score was 1.5 for the 20 patients who received local anesthesia, 0 for the patient administered sedation, and 2.1 for the 18 patients who received both local anesthesia and sedation. Patients were also asked to complete a survey about their participation in the study. Patient satisfaction was measured on a scale from 0 (not satisfied) to 6 (very satisfied). At one month post-treatment, the mean score for overall satisfaction with treatment was 5.8 (range 4-6). The mean score for overall satisfaction with study participation was 5.7 (range 2-6). The most common reason given by patients for

participating in this study was physician recommendation (91% of patients) followed closely by a shortened radiation treatment time (86%) and delivery of radiation to a smaller area of the body (77%). Twelve of the patients (27%) indicated that having a local treatment facility was a factor in their decision to participate. Study centers were all located in or near major cities with cancer centers (Oklahoma City, OK, Evergreen Park, IL, Chicago, IL, Seattle, WA, Providence, RI, San Mateo, CA, Marietta, GA, New York City, NY, White Plains, NY, Silver Spring, MD).

Adverse events were generally mild and manageable during treatment and over a median duration of follow up of 394 days. Table 3 reviews Grade 2-3 adverse events as reported by Mehta, et al. [20], and provides all Grade 1 adverse events. There were no serious adverse events. Four patients had CTC grade 3 toxicities (blistering in 1, breast tenderness in 1, and moist desquamation in 2) with subsequent resolution in the post-treatment period as described in detail elsewhere [20,25]. All other adverse events were Grade 1 or 2.

Discussion

The American Society of Breast Surgeons and the American Brachytherapy Society have published guidelines for the screening and selection of patients for APBI [22,23], and these guidelines formed the basis for patient selection in the EBT multicenter study [20]. Of the 65 patients that met the initial screening requirements, 44 patients met all eligibility criteria and were treated. The majority of the 21 patients not eligible for treatment were disqualified at the time of implantation for inadequate balloon conformance to the tumor cavity or inadequate distance from skin to balloon surface. In this study, patients were enrolled and screened post-lumpectomy. For patients undergoing lumpectomy with the intention of pursuing APBI, a surgeon should be able to determine at the time of lumpectomy whether a patient is likely to meet the eligibility requirements for successful post-operative balloon implantation [11]. The surgical technique used at the time of lumpectomy can help promote successful balloon spacing and help the patient meet the eligibility criteria. Careful attention to the depth of the lesion from the skin using ultrasound measurements is needed for optimal design of the lumpectomy and the post-lumpectomy cavity, which will determine balloon position. Many patients have tumors too close to the skin or more extensive than appreciated on pre-op and intra-op imaging. These patients end up with a narrow skin bridge or positive margins and would not be candidates for APBI. With rather simple modifications of certain oncoplastic techniques, the

Table 3 Adverse Events

Adverse Event	Grade 1	Grade 2	Grade 3
Blistering	2 (4.5%)	0	1 (2.3%)
Bruising	1 (2.3%)	0	0
Desquamation, Dry	1 (2.3%)	1 (2.3%)	0
Desquamation, Moist	1 (2.3%)	0	2 (4.5%)
Drainage, Serosanguinous	1 (2.3%)	0	0
Dry Skin (Breast)	2 (4.5%)	0	0
Ecchymosis	1 (2.3%)	0	0
Erythema, redness/rash	19 (43.2%)	8 (18.2%)	0
Fatigue	2 (4.5%)	4 (9.1%)	0
Fibrosis	1 (2.3%)	1 (2.3%)	0
Firmness (Breast tissue)	2 (4.5%)	0	0
Firmness (Skin)	2 (4.5%)	0	0
Hyperpigmentation / Hypopigmentation / Skin Discoloration	6 (13.6%)	3 (6.8%)	0
Induration	3 (6.8%)	0	0
Infection	0	2 (4.5%)	0
Itching / Pruritis	4 (9.1%)	0	0
Mass, 2.5 cm, non-calcified	1 (2.3%)	0	0
Pain (Rib)	1 (2.3%)	0	0
Pain / Tenderness / Discomfort	7 (15.9%)	5 (11.4%)	1 (2.3%)
Seroma	0	2 (4.5%)	0
Swelling	2 (4.5%)	0	0
Wound complication, non-infection	1 (2.3%)	0	0

Number (%) of treated patients reporting each adverse event by CTC grade (N = 44).
CTC = Common Terminology Criteria, cm = centimeter.

overlying skin can be excised or margin width increased in such a way that the deeper 270 degrees of the lumpectomy base is still ideally radiated and treated optimally with APBI. This requires joint pre-op planning by the surgical and radiation teams. This methodology increases dramatically the number of acceptable APBI candidates and decreases poor balloon placement and conformity issues.

An illustrated lumpectomy procedure that details optimal design of the lumpectomy cavity and overlying skin bridge in preparation for EBT balloon applicator placement was developed at this site during this trial and is included as an example; these procedures may need to be modified given individual differences between patients. Figure 1 illustrates a lesion just superior to the areola. Since a standard lumpectomy would remove approximately 1 cm of normal breast surrounding the lesion, the overlying skin bridge would be too thin for balloon-based APBI. The EBT balloon appears to be slightly thicker than other APBI balloons. When the balloon is inflated, the tissue bridge superficial to the balloon tends to compress to a greater degree with the Axxent balloon than with other APBI balloons. Consequently the overlying skin bridge should be a minimum of 1.2-1.5 cm. In this example it is necessary to excise all breast and skin within an area of less than 2.5 cm of the skin surface. As seen in Figure 2, this can readily be accomplished by using modifications of the standard oncoplastics incisions. Since the lesion in this case was close to the areolar edge, we chose a bat wing mastopexy. With this approach for APBI, we are also interested in the tissue depth between the back side of the balloon and the underlying ribs and lung. By not carrying the excision to the full thickness commonly illustrated in oncoplastics descriptions [26], we preserve some breast tissue to add to the posterior spacing and offer more lung protection.

Retractors were not used in order to avoid beveling toward the skin. Instead of retractors, two prolene stitches were placed lateral and medial to the lesion, and, as these were pulled upward, electrocautery was used to cut toward the lesion. The flat superficial surface is where the skin island is located. Beveling outward is minimal, and the bottom side of the removed tissue "V"s downward, resulting in a shape similar to that of a typical solitaire cut diamond. It is important to have supporting breast tissue structure, especially in older women.

Optimal closures (Figure 3) were performed in three layers and began deeper than conventional closure, at least 12-15 mm from the skin, making sure to take a generous thickness of tissue. The dense superficial fascia of the breast and superficial dense breast tissue when present will hold the sutures for this layer most effectively. An option for a resilient closure, which will not collapse during balloon inflation, is the use of a running barbed suture, such as a Quill suture, for each of these layers. An inflated balloon exerts pressure against the skin, and an adequate skin bridge will maintain the distance from the balloon to the skin surface. The greater the volume of the balloon, with the attendant compression of adjacent breast tissue, the more fully the target breast tissue will be irradiated to achieve margin sterilization. These techniques usually place the center of the inflated balloon slightly deeper than the original tumor center but maintain all residual breast tissues within 1 cm of the lumpectomy tightly compressed to the balloon surface for optimal therapy (Figure 4). In some patients, implantation of the balloon may be possible at the time of lumpectomy. Alternatively some surgeons have used a removable placeholder device, a cavity evaluation device (CED), to preserve the cavity while fashioning an easily accessible tract between the cavity and the skin surface [11]. This can facilitate balloon implantation in the post-operative period. Post-operative antibiotic coverage is used in this circumstance to lessen the risk of infection. As with other devices, the surgical technique should be be discussed with the radiation oncologist to enable proper treatment planning.

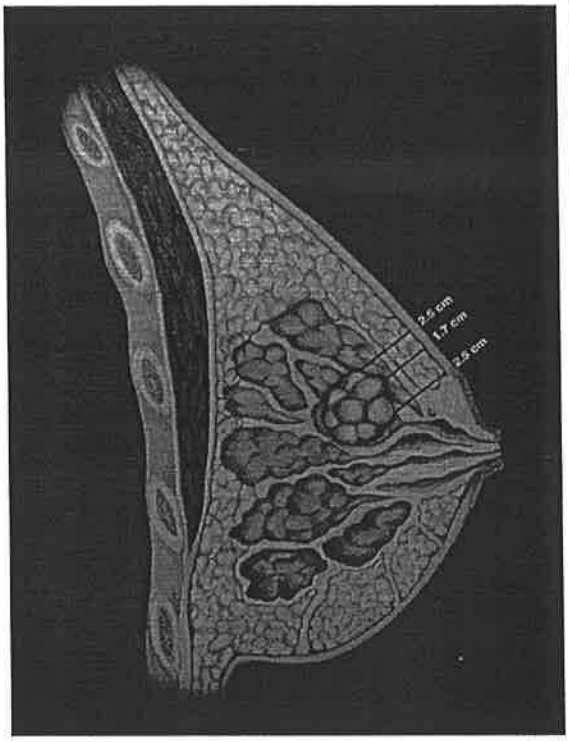

Figure 1 Side view of a small breast cancer just superior to the areolar edge.

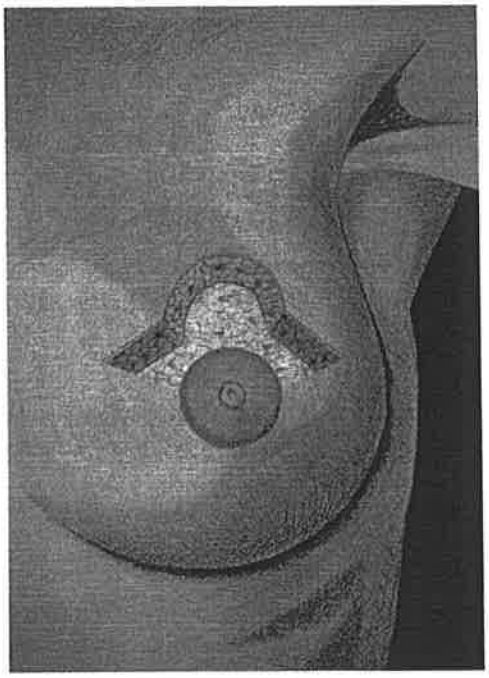

Figure 2 Modified bat wing approach. This approach allows excision of the tumor and a thin skin bridge but preserves posterior breast tissue for lung spacing.

In this study, balloon applicators were implanted up to 61 days post-lumpectomy. In the 3 patients with inadequate balloon conformance to cavity geometry, the time from lumpectomy to implantation for each was 15, 16 and 19 days, which was less than the mean for the study group. Tumor characteristics were similar between the eligible group and ineligible group. The age range of patients was 45-84 years, with a range of lesion sizes from 0.2-2.8 cm. Breast cup sizes were evenly distributed between B, C, and D. No apparent trends were noted between eligible and ineligible patients although the sample size limits statistical analysis.

The prescription dose of 34 Gy was delivered in 42/44 patients, and 2/44 patients received total doses of 30.6 and 33.96 Gy [20]. Treatment was well tolerated, and adverse events were similar to adverse events with other forms of APBI. Complications associated with the implantation of the balloon applicator are similar to complications reported during the insertion of a post surgical drain [27]. This type of complication has also been reported with ^{192}Ir-based balloon brachytherapy [11,15,16]. During this EBT study one patient had incisional redness/drainage at 3 months post-treatment, 2 patients had infection at 3 and 6 months, respectively, and 2 patients had seromas at or within 4 weeks of treatment. The patients who were

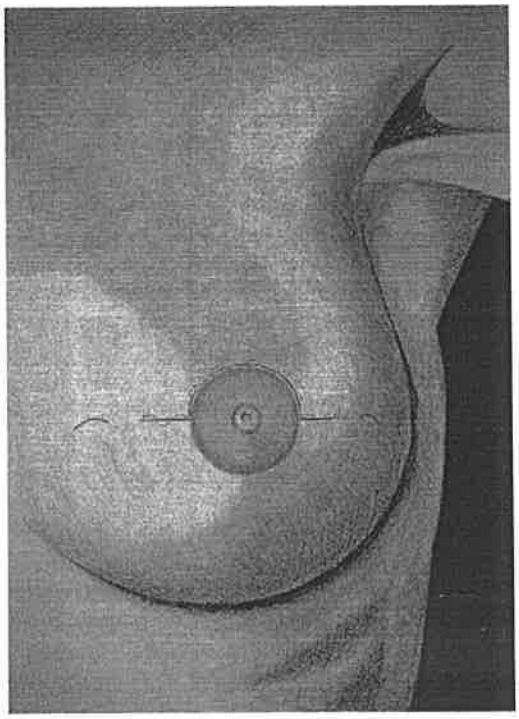

Figure 3 Closed incision with several layers of running barbed suture.

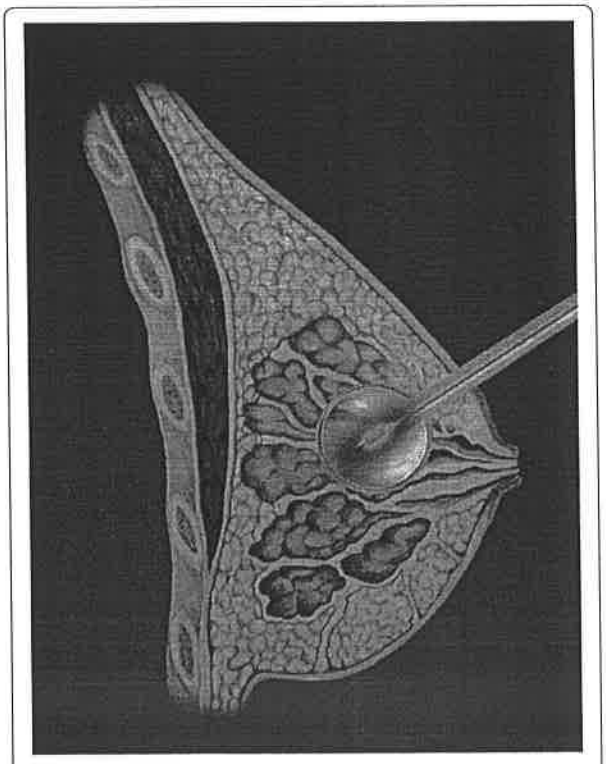

Figure 4 Electronic brachytherapy balloon inflated with source active in place with adequate skin spacing.

Table 4 Comparison electronic brachytherapy (EBT) and ^{192}Iridium brachytherapy (IBT)

Patient/Tumor Characteristics	EBT	IBT
Number of Patients Enrolled	65	75
Number of Patients Treated	44 (67.7%)	43 (57.3%)
Age: mean (range)	64 years (45-84)	69 years (50-90)
Menopausal Status: n (%)		
Pre-Menopausal	1 (2.3%)	0
Peri-Menopausal	2 (4.6%)	2 (5%)
Post-Menopausal	41 (93.2%)	41 (95%)
Tumor Size: mean (range)	1.2 cm (0.2-2.8 cm)	1.0 cm
AJCC Class: n (%)		
Tis	12 (27.3%)	0
T1a	1 (2.3%)	9 (21%)
T1b	8 (18.2%)	16 (37%)
T1c	21 (47.7%)	18 (42%)
T2	2 (4.6%)	0
Histopathologic Grade		
G1 Well Differentiated	12 (27.3%)	17 (40%)
G2 Moderately Differentiated	18 (40.9%)	16 (37%)
G3 Poorly Differentiated	10 (22.7%)	6 (14%)
Grade Not Available	4 (9.1%)	4 (9%)
Minimum Distance from Balloon to Skin Surface	6 mm	5 mm
Breast Cup Size		
A	0	1 (2%)
B	12 (27.3%)	9 (21%)
C	16 (36.4%)	15 (35%)
D+	11 (25.0%)	11 (26%)
Not reported	5 (11.4%)	7 (16%)
Cosmesis	**EBT**	**IBT**
Good - Excellent cosmesis at 1 month	35/44 (80%)	38/43 (88%)
Good - Excellent cosmesis at 1 year	24/32 (75%)	–
Good - Excellent cosmesis at 5 years	–	35/43 (81%)
Adverse Events in > 2 patients	**EBT [a]**	**IBT [b]**
Blistering	3 (6.8%)	2 (3.7%)
Bruising / hematoma	1 (2.3%)	3 (5.6%)
Catheter Site Drainage	0	28 (51.9%)
Desquamation, Dry	2 (4.5%)	7 (13.0%)
Desquamation, Moist	3 (6.8%)	3 (5.6%)
Dry Skin (Breast)	2 (4.5%)	6 (11.1%)
Ecchymosis	1 (2.3%)	17 (31.5%)
Edema (breast)	0	8 (14.8%)
Erythema, redness/rash	27 (61.4%)	31 (57.4%)
Fibrosis	2 (4.5%)	3 (5.6%)
Hyperpigmentation / Hypopigmentation	9 (20.5%)	5 (9.3%)
Induration	3 (6.8%)	1 (1.9%)
Infection	2 (4.5%)	2 (3.7%)
Itching / Pruritis	4 (9.1%)	5 (9.3%)
Pain, tenderness, discomfort	13 (29.5%)	23 (42.6%)
Rash	0	4 (7.4%)
Seroma	2 (4.5%)	6 (11.1%)
Skin Irritation	0	3 (5.6%)

Patient and tumor characteristics at baseline, cosmesis at 1 month and 1 or 5 years, and adverse events (breast and skin symptoms and signs) following EBT at 6 months as reported herein and by Mehta, et al., [20] or IBT at 1 month as reported by Keisch, et al. [21]

[a]Adverse events in 1 or 2 patients in the EBT study (not listed above) included firmness of breast tissue, skin firmness, non-calcified mass (2.5 cm), rib pain, serosanguinous drainage, swelling, and wound complication (non-infection).

[b]Adverse events in 1 or 2 patients in the IBT study (not listed above) included abscess, eschar, mastitis, serosanguinous drainage, telangiectasia, and vasodilatation.[24]

diagnosed with infection were treated with oral antibiotics, and the infections resolved. Study sites used standard wound care procedures at the skin exit site, which included the use of topical antibiotic ointment and/or hydrogen peroxide. Patients were instructed to wear a surgical bra and avoid showering during the 5-day treatment period. Patient compliance with the treatment regimen was excellent. Patients expressed satisfaction with the conduct of the study as well as the delivery of the radiotherapy based on a questionnaire given at follow-up visits. Mehta, et al., reported cosmesis to have been evaluated as good to excellent by 80% of patients at 6 months [20].

Our initial experience with both a new balloon applicator and a novel radiation source parallels the initial experience with the ^{192}Ir-based balloon brachytherapy [17,21], and the two studies are similar in enrollment, subsequent treatment eligibility, patient characteristics, tumor characteristics, and cosmetic results following EBT and ^{192}Ir-based brachytherapy as summarized in Table 4 [17,20,21]. The range and frequency of adverse events were similar for erythema, pain, and infection. However, catheter site drainage was reported in 52% of patients following ^{192}Ir-based brachytherapy but was not reported with EBT. This may be due to differences in the design of the balloon applicators. The most significant difference with the EBT system is the use of an electronic high dose rate, low energy X-ray source to generate radiation, which eliminates the issues involved in the handling and storage of radioactive isotopes [18]. Many radiation treatment centers as well as community hospitals across the United States lack the funds and infrastructure to maintain isotopes or build heavily shielded treatment rooms that are required for the delivery of HDR brachytherapy. The EBT system does not require a heavily shielded treatment room or an HDR brachytherapy afterloader. The EBT system should provide a means that will allow women not currently able to travel to radiation facilities with HDR brachytherapy afterloaders to be treated within their local communities and receive state of the art breast radiotherapy as an adjunct to modern breast conserving surgery.

Conclusions

Early stage breast cancer can be treated with breast conserving therapy and accelerated partial breast irradiation using electronic brachytherapy. Treatment was well tolerated, and these early outcomes were similar to the early outcomes with iridium-based balloon brachytherapy.

Abbreviations

APBI: accelerated partial breast irradiation; CED: cavity evaluation device; CT: computerized tomography; CTC: Common Terminology Criteria; cm: centimeter; EBT: electronic brachytherapy; Gy: gray; HDR: High dose rate; Inc: incorporated; Ir: Iridium.

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Authors' contributions

All authors contributed to treatment of patients, collection of data, review of results and manuscript, and approval of the final draft.

Competing interests

Darius Francescatti is a paid consulting surgical medical director for Xoft Inc. All other authors declare that they have no competing interests.

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Travel Distance to Radiation Therapy and Receipt of Radiotherapy Following Breast-Conserving Surgery

William F. Athas, Meg Adams-Cameron, William C. Hunt, Andrew Amir-Fazli, Charles R. Key

Breast-conserving surgery (BCS) followed by radiation therapy is an efficacious alternative treatment to mastectomy for women with early-stage breast cancer *(1,2)*. However, 15%–30% of the women treated with BCS for early-stage disease fail to undergo postoperative breast irradiation, despite the known increased risk of ipsilateral recurrence associated with the omission of radiotherapy *(3–8)*. Older age has been identified as a major determinant of not receiving radiotherapy after BCS *(4,6,7,9)*. Other factors that could account for failure to receive radiation therapy, particularly among younger women, remain to be identified.

Travel distance to a radiation-treatment facility may influence the receipt of postoperative breast irradiation. Radiotherapy that follows BCS typically involves daily treatments (weekends excluded), for a period of 5–6 consecutive weeks. The necessity of long-distance travel may increase the inconvenience or cost of radiotherapy to a point where it simply is not feasible to receive treatment. A study of breast cancer treatment conducted in the mid- to late-1980s in the Seattle–Puget Sound area found that living in a county without a radiation-treatment facility was associated with a 50% lower likelihood of receiving radiotherapy after BCS *(4)*. A similar contemporaneous study in New Mexico *(3)* found no relationship between radiotherapy and travel distance, but the analysis was limited to manual identification of geographic clustering of BCS patients not receiving radiotherapy. In this study, we used a geographic information system (GIS) to measure actual patient travel distances to radiation-treatment facilities to more precisely examine the relationship between travel distance and receipt of radiotherapy after BCS.

For our analysis, all cases of localized breast cancer diagnosed in 1994 and 1995 in female residents of New Mexico were selected from the New Mexico Tumor Registry (NMTR) database. The NMTR, a member of the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) Program,[1] collects information on all cases of cancer in New Mexico residents by use of the methods previously described *(3,8)*. Native-American women were excluded from the analysis because the NMTR does not record their addresses at diagnosis. Stage of cancer at diagnosis was coded according to the SEER Summary Staging Guide *(10)*, which defines localized cancer as an invasive cancer confined to the organ of origin. For classification of patients by treatment received, we considered all therapy that occurred in the first 4 months of cancer-directed therapy, the standard SEER definition for the first course of therapy. Surgery was classified as either mastectomy or BCS. BCS included lumpectomy or excisional biopsy, quadrantectomy, wedge resection, partial mastectomy, and subcutaneous mastectomy. For the BCS case subjects, we considered that adjuvant radiotherapy was received if the NMTR record documented radiotherapy during the first course of therapy.

The address at diagnosis was obtained for each case subject from the NMTR database and geocoded by use of ArcView 3.0a software (Environmental Systems Research Institute, Redlands, CA). Approximately 70% of the case subjects were geocoded to a unique street address. The remaining 30% of the subjects, most of whom had either post office boxes or rural routes as their addresses, were geocoded to the centroids of their ZIP codes. Twelve radiation-treatment facilities were operational in New Mexico or in nearby areas in 1995. Four facilities were located in Albuquerque, NM; two in Las Cruces, NM; one each in Santa Fe, NM, Roswell, NM, Farmington, NM, and Carlsbad, NM; and one each in El Paso, TX, and Durango, CO. Each treatment facility was geocoded to a unique street address. We assumed that each patient was treated at the nearest facility and used the GIS to calculate the shortest travel distance to it.

A total of 1122 women diagnosed with localized breast cancer were included in the analysis. Of these, 533 (48%) were treated with BCS, and 409 (77%) received radiation therapy following BCS (Table 1). Age was a strong and statistically significant predictor of post-BCS radiotherapy (two-sided P for trend <.0001). Among women less than 60 years of age, 83% received follow-up breast irradiation compared with 79% of those aged 60–69 years and 63% of those 70 years and older. After adjusting for the effects of race/ethnicity and travel distance, patients 70 years and older were roughly three times less likely to receive radiotherapy after BCS compared with patients younger than 60 years. Race/ethnicity was not predictive for receipt of radiotherapy following BCS.

After adjustment for age, the likelihood of receiving radiotherapy following BCS decreased significantly with increasing travel distance to the nearest

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See "Notes" following "References."

Table 1. Effect of age, race/ethnicity, and travel distance to nearest radiation-treatment facility on the likelihood of receiving radiation therapy (RT) following breast-conserving surgery (BCS) for early-stage breast cancer (New Mexico, 1994–1995)

	No. of case patients	No. who received BCS (%)	No. who received RT following BCS (%)	Odds ratio (95% CI)*	*P* for trend†
All	1122	533 (48)	409 (77)		
Age, y					
<50	248	131 (53)	107 (82)	1.00 (referent)	
50–59	236	141 (60)	120 (85)	1.24 (0.64–2.44)	
60–69	257	112 (44)	88 (79)	0.88 (0.45–1.72)	
≥70	381	149 (39)	94 (63)	0.36 (0.20–0.64)	<.0001
Race/ethnicity					
White, non-Hispanic	810	391 (48)	295 (75)	1.00 (referent)	
White, Hispanic	270	123 (46)	97 (79)	0.84 (0.49–1.43)	
Other	42	19 (45)	17 (89)	2.01 (0.40–10.2)	
Travel distance, miles					
<10.0	621	298 (48)	243 (82)	1.00 (referent)	
10.0–24.9	158	87 (55)	75 (86)	1.22 (0.61–2.45)	
25.0–49.9	76	40 (53)	31 (78)	0.64 (0.28–1.46)	
50.0–74.9	79	26 (33)	18 (69)	0.48 (0.19–1.19)	
75.0–99.9	100	51 (51)	29 (57)	0.26 (0.14–0.50)	
≥100.0	88	31 (35)	13 (42)	0.13 (0.06–0.30)	<.0001

*Odds ratios and 95% confidence intervals (CIs) were adjusted for age, race/ethnicity, and travel distance by use of multiple logistic regression.
†Tests for trend were computed by fitting logistic regression models to continuous values of the variables. All *P* values are two-sided.

radiation-treatment facility (two-sided *P* for trend <.0001). Only 51% of the women living 75 miles or more from the closest facility received follow-up radiotherapy compared with 69% of those living 50–74.9 miles away and 82% of those residing within 50 miles' travel distance. The percentage of women receiving BCS compared with those who received mastectomy did not vary according to travel distance for radiotherapy (data not shown).

To illustrate the travel-distance relationship on a continuous scale, a smoothed plot of the adjusted log-odds and travel distance was produced by use of a generalized additive model (Fig. 1). A square-root transformation of travel distance was used to spread out the data and to provide greater visual clarity for distances less than 20 miles. The likelihood of receiving radiotherapy after BCS increased slightly with travel distance to approximately 10 miles, then declined steadily at greater distances.

Our finding of a significant inverse relationship between travel distance and receipt of radiotherapy following BCS could, in part, reflect an inability to accurately establish administration of radiotherapy for case subjects residing in outlying areas. This seems unlikely, given that NMTR personnel routinely review treatment information at all radiation facilities in the state and nearby out-of-state areas to document therapy as completely as possible. Our substitution of ZIP code centroids for street addresses for those case subjects without a unique address at diagnosis also may have produced a spurious result. Again, this seems unlikely, since travel distances calculated from unique street addresses were strongly correlated (Pearson $r = .97$) with distances calculated

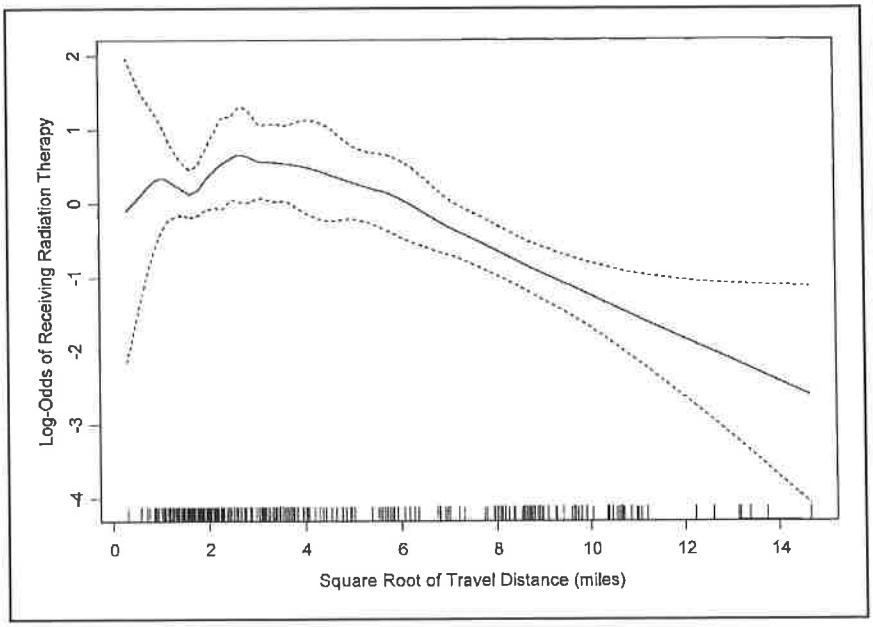

Fig. 1. Log-odds of receiving radiation therapy following breast-conserving surgery for early-stage breast cancer is plotted against the square root of travel distance to the nearest radiation-treatment facility. The smooth curve (**solid line**) was produced by use of a generalized additive model *(11)* computed with the "gam" function of S-PLUS *(12)*. The model, a generalization of the usual logistic regression model, allows the effect of travel distance to be incorporated as an arbitrary smooth function. We chose a locally weighted running-line smoother (S-PLUS LOESS) with a span of 0.50. With this LOESS smoother, the fitted value at each observed travel distance is computed from a weighted logistic regression by use of the 50% of the data that are nearest to the target point. The weight given to each data point decreases rapidly with the distance from the target point. The model contained an LOESS term for age and an indicator for non-Hispanic white race/ethnicity. Approximate 95% pointwise confidence intervals for the curve are given (**dashed lines**), and the "rug" at the base of the figure shows the frequency distribution of travel distances.

from corresponding ZIP code centroids. We also believe that calculating travel distances by assuming treatment at the nearest radiation-treatment facility did not introduce a serious misclassification error into our analysis. The small number of treatment facilities (n = 12) and the relatively large distances between major population centers in New Mexico likely mean that most patients receive radiotherapy as close to home as possible.

A number of factors may influence the observed association between travel distance and radiation treatment, including socioeconomic status, type of health care insurance, and regional practice patterns. Such factors were not examined in this study and warrant further investigation. Our observation that travel distance did not influence whether a patient received BCS or whether she received mastectomy suggests that little geographic variation in practice style in the use of adjuvant radiotherapy occurs in New Mexico. We are currently conducting a survey of New Mexico women treated only with BCS for early-stage breast cancer to gain insight into why they did not receive adjuvant radiation therapy. Results from our ongoing study should assist in the interpretation of the findings reported here.

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NOTES

[1]*Editor's note:* SEER is a set of geographically defined, population-based, central cancer registries in the United States, operated by local nonprofit organizations under contract to the National Cancer Institute (NCI). Registry data are submitted electronically without personal identifiers to the NCI on a biannual basis, and the NCI makes the data available to the public for scientific research.

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Patient Compliance Is Critical for Equivalent Clinical Outcomes for Breast Cancer Treated by Breast-Conservation Therapy

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Abstract

Objective: To determine the compliance with a standard breast-conservation therapy (BCT) program in a predominantly indigent, minority population of patients with early breast cancer (stage I and II) served by a rural state institution in the South; to compare the clinical outcomes of this group with those reported in clinical trials; and to examine the socioeconomic factors that may have contributed to the rate of compliance.

Summary Background Data: Disease-free survival and overall survival in early breast cancer treated by BCT versus modified radical mastectomy are reported to be equivalent in prospective randomized trials. However, patients enrolled in clinical trials may not be representative of patients living in the various diverse communities that make up the United States. The authors' hypothesis is that patients enrolled in clinical trials at the national level may not be representative of indigent patients in the rural South and that clinical trial results may not be directly applicable.

Methods: A retrospective review of 55 women with early-stage breast cancer treated from 1990 to 1995 was performed. Clinical data, compliance with treatment and clinical follow-up, and recurrence rates were examined. Statistical analysis performed include the Fisher exact test, Kaplan-Meier survival analysis, and log-

rank test.

Results: Full compliance (defined as completion of the entire course of radiation therapy and clinical follow-up) with the BCT program was observed in only 36% of patients. Fifteen of the 35 noncompliant patients did not complete radiation therapy. A significantly higher local failure rate was observed: 8 of these 15 patients (53%) have had local failure. In contrast, patients who were either in full compliance with the BCT program or were deficient only in that they missed part of their clinical follow-up had local failure rates of 5% (1/20) and 10% (2/20), respectively. Age, race, stage of cancer, economic status (measured by availability of medical insurance), distance of patient's residence from the hospital, and education level were evaluated as potential predictors of compliance. None predicted patient compliance, although a trend toward higher compliance was noted in patients with a higher education level, as determined by literacy testing.

Conclusions: Compliance with the BCT protocol at the authors' institution was worse than reported in clinical trials, and noncompliance translated into a significant increase in the local failure rate. Factors examined suggest that literacy may play a role in predicting compliance. Although BCT should be discussed with all breast cancer patients, the judicious application of clinical trial data to an institution's local population is warranted.

Several studies have reported that the percentage of patients with breast carcinoma treated by breast-conservation therapy (BCT) is lowest in the southern region of the United States. 1-4 Socioeconomic factors, such as age, race, income level, access to regional treatment centers, and education level, have also been proposed as determinants of the use of BCT for the treatment of early breast cancer. 5-7

Based on carefully designed prospective randomized trials, the result of BCT for the treatment of early-stage breast cancer, as measured by local recurrence and overall survival, is equivalent to that of modified radical mastectomy. 8-11 The investigators from the National Surgical Adjuvant Breast and Bowel Project (NSABP B-06) concluded after a 12-year follow-up that no significant differences were found in overall survival, disease-free survival, or distant disease-free survival in patients treated by lumpectomy, axillary node dissection, and radiation therapy (XRT) compared with modified radical mastectomy. 10 Based on data from this and other prospective randomized trials evaluating BCT versus modified radical mastectomy, the National Institutes of Health issued recommendations after a consensus development conference that BCT with XRT was preferable for most women with stage I and II breast cancer. 12

Large clinical trials are performed under optimal conditions with excellent compliance and follow-up rates. The success of BCT is highly dependent on compliance with XRT to minimize the risk for local recurrence. In the reanalysis of

the NSABP B-06 trial at 12 years of follow-up, patients treated with lumpectomy without XRT had a local failure (LF) rate of 35%. The LF rate was approximately 10% in patients treated with lumpectomy and XRT. These results were comparable to those of other clinical trials addressing the same issue. 9,10

The success of BCT is also highly dependent on clinical follow-up to identify, in a timely fashion, patients in whom local recurrence does develop. In the NSABP B-06 trial, patients with local recurrence underwent mastectomy, and this resulted in overall survival rates equivalent to modified radical mastectomy. 10 However, if local recurrence were not identified in a timely fashion by a clinical follow-up program, the chance for cure is likely to be reduced.

Patients enrolled in clinical trials may not be representative of patients living in the various diverse communities that make up the United States. Regional access to healthcare and socioeconomic factors such as education level, cultural background, and personal income may have an impact on compliance. 4-7 Our hypothesis is that patients enrolled in clinical trials at the national level may not be representative of indigent patients in the rural South, and that clinical trial results may not be directly applicable. Thus, in this study, we intend to examine compliance with a BCT program and the resulting clinical outcomes in a population of primarily indigent patients served by a public hospital in the rural South. The objectives are to determine the compliance with a standard BCT program (XRT and clinical follow-up), to compare the clinical outcomes of these patients with those reported in clinical trials, and to examine the socioeconomic factors that may have contributed to the rate of compliance.

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Impact of Patient Distance to Radiation Therapy on Mastectomy Use in Early-Stage Breast Cancer Patients

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Abstract

Purpose Treatment access underlies quality cancer care. We hypothesize that mastectomy rates in a rural state are independently influenced by distance to radiation therapy (XRT) and by changing XRT access through opening new facilities.

Patients and Methods Early-stage breast cancer patients diagnosed from 1996 to 2000 were identified in the Virginia state registry. Distance from patient zip code to nearest XRT facility was calculated with geographical software. Distance to XRT facility (≤ 10, > 10 to 25, > 25 to 50, and > 50 miles), American Joint Committee on Cancer tumor stage, age, race, and diagnosis year were evaluated for influencing mastectomy rate. Mastectomy use within 15 miles of five new facilities was assessed before and after opening.

Results Among 20,094 patients, 43% underwent mastectomy, 53% underwent lumpectomy, and therapy of 4% of patients is unknown. Twenty-nine percent of patients lived more than 10 miles from XRT facility. Mastectomy increased with distance to XRT facility (43% at ≤ 10 miles, 47% at > 10 to 25 miles, 53% at > 25 to 50 miles, and 58% at > 50 miles; $P < .001$). Among 11,597 patients with T1 (< 2 cm) tumors, mastectomy also varied by distance (31% at ≤ 10 miles, 36% at > 10 to 25 miles, 41% at > 25 to 50 miles, and 49% at > 50 miles; $P < .001$). In multivariate analysis, mastectomy use was independently influenced by XRT distance after adjusting for age, race, T stage, and diagnosis year. Over the study period, mastectomy rates declined from 48% to 43% across Virginia, and there were similar declines in a 15-mile area around four new radiation facilities in urban settings. However, mastectomies decreased from 61% to 45% around a new XRT facility in a rural setting.

Conclusion Distance to XRT facility significantly impacts mastectomy use. Opportunities for increasing breast-conservation rates through improved XRT access exist.

INTRODUCTION

Access to appropriate and current cancer treatment resources is a fundamental condition for achieving universal, high-quality cancer care in the United States. The National Institutes of Health Consensus Conference statement of 1990 established breast conservation as a standard of quality

care by concluding that "breast conservation treatment is an appropriate method of primary therapy for the majority of women with stage I and II breast cancer."[1] Breast-conserving therapy (BCT) entails surgical removal of the primary tumor with adequate margins, evaluation of the axillary nodes, and local breast irradiation. The use of BCT serves as an important measure of variation in treatment patterns for a population. Although clinician and patient preferences and socioeconomic factors have important roles in treatment patterns, another important and potentially mutable factor in breast cancer treatment patterns is access to the radiation therapy (XRT) services essential to BCT.

Studies to date have been inconsistent in evaluating whether inconvenient geographic access to XRT serves as a deterrent to BCT.[2-7] Some studies demonstrated an association between lumpectomy rates and geographic proximity to XRT.[3,6,7] Other studies found an association between distance to XRT and adherence to recommended postlumpectomy radiation but not with the lumpectomy rate itself.[2,4] A study evaluating patients in the Surveillance, Epidemiology, and End Results (SEER) program found that BCT decreased when patients lived in zip codes 15 or more miles from the nearest XRT facility. Within the SEER population, which is more urban than the overall US population, only 11% of women lived greater than 15 miles from a XRT facility.[6] It is anticipated that limited access to XRT would have a greater impact for the general US population. Furthermore, given that more than 200,000 women will be diagnosed with breast cancer annually, evaluating a modifiable factor, such as XRT accessibility, could influence treatment for thousands of patients each year, even if the proportion of patients affected is small.

Although increases in BCT have been noted during the 1980s and 1990s throughout the United States, lower rates of BCT have repeatedly been documented in states of the South Central or South Atlantic United States.[8,9] The basis for this geographic variation is not clear, but the significant variations seen in treatment patterns for breast cancer may suggest that factors related to providers or institutions heavily influence surgical decision making and possibly surpass patient choice in determining surgical treatment.[10] Variation in surgical breast cancer treatment stemming from patient choice is not an issue of appropriateness of care, provided that each woman is given fair and accurate treatment option information from which to make a choice and that XRT is logistically a feasible option. Practice variation resulting from inadequate access to care merits careful research on a regional level so that the results can target improvements in medical practice and health resource allocation.

This study comprehensively evaluates the impact of distance to XRT on surgical breast cancer treatment in Virginia, a southern state previously identified as having below-average BCT rates.[8] Virginia is an excellent state to study because of extreme regional differences in socioeconomic conditions and health care access. The state's population ranges from largely underserved rural areas in southwest Virginia, including Appalachian communities, to highly urbanized populations of the Tidewater area and the northern Virginia suburbs of Washington, DC. Clarifying the relationship of distance to XRT and treatment practices is also timely because the introduction of new technologies (eg, accelerated partial breast irradiation and accelerated hypofractionated XRT) may reshape certain barriers by significantly reducing the amount of time required to undergo XRT. This study was designed to determine whether greater distance to XRT is associated with higher mastectomy rates across a diverse population and to assess the impact of changing distance to XRT on surgical treatment patterns.

PATIENTS AND METHODS

Patient Identification and Characteristics

The study design was a cross-sectional analysis of all early-stage invasive breast cancer cases collected by the Virginia Cancer Registry (VCR) over a 5-year period. Virginia law requires cancer case reporting within 6 months of diagnosis. Mandatory case reporting went into effect in 1990 in Virginia. Cases are documented by patient residence, even if medical care is sought outside the state. The VCR estimates a 90% average complete case ascertainment rate in 1996 to 2000. All patients residing in Virginia who were diagnosed with local or regional breast cancer, as defined by the SEER program extent of disease (EOD) criteria, between January 1, 1996, and December 31, 2000, and whose cases were reported to the VCR by June 2003 were identified. Exclusion criteria included male breast cancers, carcinoma-in-situ, metastatic or recurrent breast cancer, and histology not consistent with adenocarcinoma. Patients without a zip code adequate for geographic mapping were also excluded. For the majority of patients, information pertaining to the American Joint Committee on Cancer staging criteria was available, but this information was not as complete as staging by SEER EOD criteria; therefore, EOD criteria were used to select eligible patients. Tumor size was categorized by American Joint Committee on Cancer definitions as T1 (≤ 2 cm), T2 (> 2 to 5 cm), and T3 (> 5 cm). Tumor size measurements were available for 91% of eligible patients included in this study.

In addition to staging information, patient age at diagnosis and race were obtained from the VCR data for each patient. Race was coded as white, black, or other (including American Indian, Asian, and unknown). Primary surgical therapy was categorized as mastectomy, breast-conserving surgery (ie, lumpectomy, quadrantectomy, and segmental mastectomy), or unknown. In cases where both a breast-conserving procedure and a complete mastectomy were listed in the VCR data, mastectomy was considered the definitive surgical treatment and was coded as the surgical procedure for analysis. The VCR does not collect information regarding personal or family cancer history.

Distance to XRT Facilities

Thirty-seven XRT facilities were identified in Virginia through the cancer registry and the American Hospital Association Annual Survey of Hospitals 2002.[11] These facilities were confirmed by telephone call to be delivering breast XRT in 1996 to 2000. Facilities that opened during the study period were included for analysis in patients diagnosed the year after the opening of the XRT center. Two facilities opened during 1996 and were considered in evaluation of treatment patterns for patients diagnosed in 1997 or later; two facilities opened during 1997 and were included for patients diagnosed in 1998 or later; and one facility opened during 1998 and was included for patients diagnosed in 1999 or later. The distance from the centroid of each zip code in Virginia to the nearest XRT facility was calculated with the point distance tool in ArcGIS 8.0 (Environmental Systems Research Institute, Redlands, CA), which is geographic software that allows calculation of straight-line distance. In calculating these distances, the XRT facilities available each year were considered, as summarized earlier. These date-specific distance calculations were then linked by zip code to each patient. Distances in miles were categorized as ≤ 10, more than 10 to 25, more than 25 to 50, and more than 50 miles.

Impact of Changing XRT Distance

Five new XRT facilities opened during the study period, creating an opportunity to study the impact of changing distance to XRT on surgical treatment patterns. Two facilities opened in Northern Virginia (facilities A and B), two opened in Eastern Virginia (facilities C and D), and one opened in Southwest Virginia (facility E). Facilities A through D are located in urban areas, whereas facility E is situated in a rural part of the state. The impact of changing XRT access is presented descriptively before and after opening the new XRT facility in the following two manners: by the proportion of breast

cancer patients within a 50-mile radius around each of the five new XRT facilities who now live within 15 miles of an XRT facility and by the proportion of patients within 15 miles of a new XRT site receiving mastectomy. These data are presented by a 15-mile distance from an XRT site because this distance marked a significant difference in breast-conservation rates within the SEER population reported in a prior study. This study also used straight-line distance measurements, which served as a good comparison.[6] Because of the limited number of new facilities, more complex statistical analysis was not undertaken.

Data Analysis

The use of mastectomy versus breast-conserving surgery was evaluated by patient age, race, tumor size, SEER EOD criteria, year of diagnosis, and distance to nearest XRT facility using Pearson χ^2 test for categoric variables and the Student's *t* test or analysis of variance for continuous variables. To determine the significance of associations identified on bivariate analysis, a logistic regression model was used to calculate an odds ratio for undergoing mastectomy rather than breast conservation. These odds ratios were adjusted for patient age, race, year of diagnosis, SEER EOD, tumor size, and distance to nearest XRT facility. Analytic tests were performed with Stata 7.0 software (STATA Corp, College Station, TX). This project was approved separately by the Institutional Review Boards of the Virginia Department of Health and of the University of Virginia School of Medicine.

RESULTS

Patient Characteristics

During the 5-year study period, 20,287 women with local or regional breast cancer were reported across the state to the VCR. Seventy patients (38 with phyllodes tumors and 32 with sarcomatous tumors) were excluded based on histology. An additional 123 patients were excluded because they lacked a zip code that was recognized as a distinct geographic location by ArcGIS 8.0. A total of 20,094 patients (99%) remained for analysis. Table 1 lists the patient, tumor, and geographic characteristics of the study patients. Distances from zip code centroid to nearest XRT facility ranged from 0.2 to 85.4 miles, with a median distance to nearest XRT facility of 4.6 miles. Twenty-two percent of this cohort lived 15 or more miles from an XRT facility.

Patient Characteristics in Relation to Distance to XRT Facility

Race, age, and tumor size varied with distance to nearest XRT facility (complete data not shown) and were, therefore, included in the multivariate model. White women and older women were more likely to live further away from an XRT facility. Tumors of 2 cm or less in size were diagnosed in 53% of women living greater than 50 miles from an XRT facility and in approximately 63% of women living within 50 miles of an XRT facility ($P = .003$). Smaller tumors were also more likely to be diagnosed in white women and in older women. Interaction effects between tumor size and distance to XRT facility, as well as interactions between patient age or race and distance to XRT facility, were tested and not found to be significant in multivariate analysis (complete data not shown).

Surgical Treatment Patterns

The associations of mastectomy rate with patient age, race, year of diagnosis, tumor size, EOD, and distance to nearest XRT facility are listed in Table 1. Women greater than 70 years of age were more likely to undergo mastectomy than women younger than 70 years of age (49% *v* 43%, respectively; $P < .001$). Mastectomy rates increased with increasing tumor size. Among women younger than 70 years, 30% with T1 and 55% with T2 tumors underwent a mastectomy. In contrast, among women aged 70 years or older, 38% with T1 and 64% with T2 tumors underwent a mastectomy (data not shown). Although

white and black women were treated with a mastectomy in equal proportions (44% *v* 45%, respectively), women of other races or ethnicities were treated with a higher rate of mastectomy (59%; $P < .001$).

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Table 1.
General Characteristics of Women With Breast Cancer Diagnosed Between 1996 and 2000 in Virginia and Features Associated With Surgical Treatment by Mastectomy

Distance to XRT Facility and Mastectomy Rate

Increasing mastectomy rates were associated with longer distances from zip code centroid to nearest XRT facility (Fig 1 and Table 1). Among patients with T1 tumors alone, this association between higher mastectomy rate and greater distance to XRT facility was particularly evident (Fig 2). In the subset of women with T1 tumors, the mastectomy rate increased from 31% for women living less than 10 miles from an XRT facility to 49% for women living more than 50 miles from an XRT facility ($P < .001$; Fig 2). Adjusted odds ratios for treatment with mastectomy rather than breast-conserving surgery are listed in Table 2. Tumor size was the most influential determinant of procedure type and was consistent with standard recommended therapy. Increasing distance to nearest XRT facility had a significant and independent association with mastectomy use, even comparing 10 to 25 miles with less than 10 miles (Table 2).

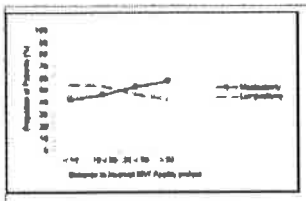

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Fig 1.

Relationship of surgical procedure and distance to nearest radiation therapy (XRT) facility.

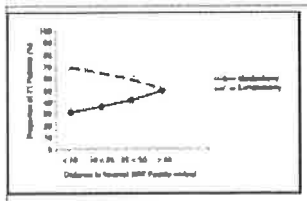

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Fig 2.

Relationship of surgical procedure and distance to nearest radiation therapy (XRT) facility for patients with T1 (≤ 2 cm) tumors.

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Table 2.
OR for Treatment With Mastectomy Rather Than Breast-Conserving Surgery Among Patients With Tumor Size and Surgical Procedure Known

Impact of Changing XRT Access on Surgical Treatment Patterns

Essentially, no change in the proportion of patients living within 15 miles of a new XRT facility was seen in the area around the two facilities located in

densely urban Northern Virginia. In contrast, a relative decrease in the proportion of patients within a 50-mile radius of the facilities in Eastern and Southwest Virginia now living greater than 15 miles from the nearest XRT facility was seen (Table 3). Mastectomy use before and after a new facility opened for patients living within a 15-mile radius of each new facility is also shown in Table 3. These changes were viewed in the context of gradually declining mastectomy rates in the state as a whole over the 5-year study period (Fig 3). Mastectomy use declined most markedly in the patient population living in zip codes 15 miles or less around rural facility E after the facility opened in 1997. Within 15 miles of facility E, mastectomy rates decreased from 61% to 45%, whereas mastectomy rates in the state overall decreased from 48% to 43%.

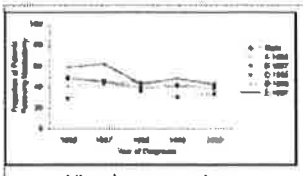

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Fig 3.

Percent of patients receiving mastectomy averaged per year for the state and for 15-mile radii around each new radiation therapy (XRT) facility. Years in legend indicate year new XRT facility opened.

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Table 3.
Change in Geographic Access to XRT As Measured by Proportion of Patients Within a 50-Mile Radius of a New XRT Facility Living Greater Than 15 Miles From Nearest XRT Facility and by Proportion of Patients in 15-Mile Radius of New-XRT Facility Receiving Mastectomy

DISCUSSION

Patient distance to the nearest XRT facility was independently associated with breast cancer surgical therapy within a state characterized by a diverse rural and urban population. The relationship between longer distance to the nearest XRT facility and higher mastectomy use was independent of tumor size, year of diagnosis, and patient age and race. This association with higher mastectomy use was noted with distances 10 miles or greater from the nearest XRT facility. The nearly linear relationship between distance to XRT and mastectomy use was evident for the entire patient population and also extended to analysis of patients with T1 tumors alone. From a standpoint of surgical technique, essentially every patient with a tumor 2 cm or smaller should be a candidate for breast-conserving surgery. Therefore, implications of an association between geographic access to XRT and surgical treatment patterns is particularly striking in this subgroup of patients with smaller tumors and represents a real opportunity for affecting treatment patterns.

Our study further suggests that a marked change in geographic access to XRT by opening new facilities may correlate with an increase in the proportion of patients undergoing breast conservation. Although new XRT facilities may have a significant impact on practice patterns, constructing new XRT facilities in rural or underserved areas may not be cost effective because of underutilization of the new facility. However, regional strategic planning studies should be conducted before reaching that conclusion. A less costly option includes providing patient housing assistance in proximity to XRT facilities. Housing assistance may well offer a financially sound alternative and serve as reasonable policy for states committed to improving access to care for rural communities.

New developments in accelerated partial breast irradiation[12-14] and accelerated hypofractionated irradiation of the whole breast,[15,16] as alternatives to routine whole-breast XRT consisting of 45 to 50 Gy in 25 fractions plus boost irradiation of 10 to 16 Gy in 5 to 8 fractions, may also help alleviate the problems created by long distances to XRT. It is speculated that the significant reduction in time required to receive accelerated breast irradiation (1 to 3 weeks for accelerated partial breast or hypofractionated radiation protocols *v* 6 to 7 weeks for standard external-beam irradiation) will ameliorate some of the logistical problems women currently face in completing BCT.[14,16] However, long-term follow-up studies and larger trials will be required before these technologies replace or are equal to the current standard of care. No population-based studies have yet been performed to evaluate whether these technologies will have an appreciable impact on BCT rates. Finally, additional studies may define certain select subgroups of patients who may not gain a clinically significant benefit from XRT after lumpectomy, thus not requiring XRT for all patients undergoing breast-conserving surgery. A recently published study conducted by the Cancer and Leukemia Group B, Eastern Cooperative Oncology Group, and Radiation Therapy Oncology Group showed that, among women over 70 years of age with small, estrogen receptor–positive tumors, treatment with lumpectomy and tamoxifen alone may constitute an appropriate therapy course.[17]

The results from previous studies on distance to XRT and surgical practice patterns have been variable. Athas et al,[2] who studied women in New Mexico with breast cancer diagnosed between 1994 and 1995, reported that the percentage of women receiving a mastectomy did not vary with XRT travel distance. However, 51% of women living greater than 75 miles from an XRT facility received breast irradiation as part of BCT compared with 82% of women living within 50 miles. In contrast, a study using the Connecticut state registry used services available at the patient's first admitting hospital for breast cancer treatment as a measure of access to therapy. This study showed an association of lower breast-conservation rates with a lack of XRT availability. The Connecticut study did not find a relationship between receiving postlumpectomy XRT and the presence of an XRT facility at the admitting hospital.[7] Nattinger et al[6] reported on 21,135 women diagnosed with breast cancer from 1991 through 1992 from the SEER registry, excluding Hawaii. They noted a significant decrease in breast-conserving surgery for women greater than 15 miles from the nearest XRT facility and a decrease in receiving postlumpectomy XRT for women greater than 40 miles from the nearest XRT facility.[6] In contrast to this population, where only 11% of the affected population lived 15 miles or more away from an XRT facility, 22% of breast cancer patients within our whole-state cohort lived greater than 15 miles away from radiotherapy services. Because certain decisions regarding health care policy and resource allocation are made on a state level, studying the impact of XRT access in a state with historically high mastectomy rates, as in our study, takes on additional relevance.

This study has several limitations. Because this study used straight-line distance calculations, the distance to XRT facility in actual travel distance may well be underestimated in the more mountainous areas of the state. Cancer registry data is primarily limited by incomplete collection of data for outpatient cancer treatments. This limitation is not unique to the VCR. XRT, chemotherapy, and hormonal therapy, which are all integral treatments for breast cancer, are variably recorded in any population-based data set but critical to monitoring quality of care. For example, our data set could not be used to evaluate the appropriateness of care for patients undergoing BCT because it was not possible to distinguish between patients with no and unknown XRT receipt. Our data show that 73% of patients having a lumpectomy did have adjuvant XRT but XRT treatment status is unknown for the other 27%. Because this study does not identify where XRT is received, it is not known whether patients routinely use the closest XRT facility or how far

patients commonly travel for XRT. Other potentially meaningful information, such as data about treating hospitals or physicians and data on patient insurance status, was not available from VCR secondary to confidentiality policies or was not adequately reported to be included in the analysis, respectively. Potential inaccuracies and underreporting represent the inherent limitations of all cancer registries. In particular, VCR cautions that cancer cases are likely underreported from areas such as rural Southwest Virginia. However, unless missing patients were predominantly treated with breast conservation, which seems unlikely, this limitation does not dilute the study's findings.

This study also highlights far-reaching issues related to researching barriers to care. Attributing causality or proportional influence to any one factor in assessing access to care poses a significant challenge for health services research. This particular project focused only on one facet of access to care, namely geographic access to XRT. To better estimate the separate influence of physical distance to XRT on breast cancer treatment decisions, a future study will need to incorporate patient socioeconomic information, such as education level and payer status, and physician information, such as specialty training, breast cancer patient volume, and time since training. All of these factors may arguably influence treatment recommendations and choices.

Although the breast-conservation rates observed in Virginia between 1996 and 2000 are now fairly commensurate with national averages,[18,19] the results of this study suggest that opportunities exist to improve care for women residing in areas remote to XRT facilities. This study's findings that women living farther from XRT facilities tend to be diagnosed with larger tumors further underscores the unmet health care needs, such as breast cancer screening, of underserved populations. Our finding that nonwhite women were more likely to be diagnosed with larger tumors despite, on the whole, living closer to XRT facilities than white women likely has a multifactorial explanation but, to some degree, reflects other barriers to care such as inadequate health insurance coverage. Future studies in monitoring quality care in breast cancer therapy will need to measure factors not commonly found in population-based datasets, such as patient socioeconomic status and treating physician characteristics, in a meaningful way. Linking this information to treatment data in a population-based setting is the next step in better understanding the patterns in breast cancer care.

Authors' Disclosures of Potential Conflicts of Interest

The authors indicated no potential conflicts of interest.

Acknowledgments

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Footnotes

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Authors' disclosures of potential conflicts of interest are found at the end of this article.

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Differences in Male Breast Cancer Stage, Tumor Size at

N Engl J Med. 1988 Mar 10;318(10):612-7.

Social and economic factors in the choice of lung cancer treatment. A population-based study in two rural states.

Greenberg ER, Chute CG, Stukel T, Baron JA, Freeman DH, Yates J, Korson R.

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Abstract

We reviewed 1808 hospital charts representing virtually all patients given a diagnosis of non-small-cell lung cancer in New Hampshire and Vermont between 1973 and 1976 and found that the treatment of patients varied according to their marital status, medical insurance coverage, and proximity to a cancer-treatment center. Patients were more likely to be treated with surgery if they were married (odds ratio, 1.67; 95 percent confidence interval, 1.08 to 2.57) or had private medical insurance (1.52; 1.03 to 2.26). Among patients who did not have surgery, those with private insurance were more likely to receive another form of anticancer therapy--either radiation or chemotherapy (1.57; 1.18 to 2.09). Residing farther from a cancer-treatment center was associated with a greater chance of having surgery. Patients 75 years of age and older were less likely to have surgery (0.16; 0.08 to 0.35) or any other tumor-directed therapy (0.32; 0.19 to 0.54). The relation between the type of treatment and a patient's characteristics was not based on apparent differences in tumor stage or functional status, although both these factors were also strongly predictive of the type of treatment. Despite the fact that privately insured and married patients were more aggressively treated, they did not survive longer after diagnosis. We conclude that for non-small-cell lung cancer, socio-economic as well as medical factors determine treatment.

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Factors Associated With Initial Therapy for Clinically Localized Prostate Cancer: Prostate Cancer Outcomes Study

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Abstract

Background: Because of the lack of results from randomized clinical trials comparing the efficacy of aggressive therapies with that of more conservative therapies for clinically localized prostate cancer, men and their physicians may select treatments based on other criteria. We examined the association of sociodemographic and clinical characteristics with four management options: radical prostatectomy, radiation therapy, hormonal therapy, and watchful waiting. *Methods:* We studied 3073 participants of the Prostate Cancer Outcomes Study diagnosed from October 1, 1994, through October 31, 1995, with clinically localized disease (T1 or T2). Participants completed a baseline survey, and diagnostic and treatment information was abstracted from medical records. Multiple logistic regression analysis identified factors associated with initial treatment. All statistical tests were two-sided. *Results:* Patients with clinically localized disease received the following treatments: radical prostatectomy (47.6%), radiation therapy (23.4%), hormonal therapy (10.5%), or watchful waiting (18.5%). Men aged 75 years or older more often received conservative treatment (i.e., hormonal therapy alone or watchful waiting; 57.9% of men aged 75–79 years and 82.1% of men aged 80 years and older) than aggressive treatment (i.e., radical prostatectomy or radiation therapy) (for all age groups, $P \leq .001$). After adjustment for age, clinical stage, baseline prostate-specific

adjustment for age, clinical stage, baseline prostate-specific antigen level, and histologic grade, the following factors were associated with conservative treatment: history of a heart attack, being unmarried, geographic region, poor pretreatment bladder control, and impotence. In men younger than 60 years, use of aggressive treatment was similar by race/ethnicity (adjusted percentages = 85.5%, 88.1%, and 85.3% for white, African-American, and Hispanic men, respectively). However, among men 60 years old and older, African-American men underwent aggressive treatment less often than did white men or Hispanic men (adjusted percentages for men aged 60–64 years = 67.1%, 84.7%, and 79.2%, respectively; 65–74 years = 64.8%, 73.4%, and 79.5%, respectively; and 75 years old and older = 25.2%, 45.7%, and 36.6%, respectively). *Conclusions:* The association of nonclinical factors with treatment suggests that, in the absence of definitive information regarding treatment effectiveness, men diagnosed with prostate cancer should be better informed of the risks and benefits of all treatment options.

To date, no randomized clinical trials have been completed that definitively establish the efficacy of radical prostatectomy or radiation therapy for the treatment of localized prostate cancer *(1)*. Currently ongoing trials, many years from completion, are testing these aggressive therapies against conservative management consisting of hormonal therapy or observation *(2)*. For older men with early-stage disease, observational studies *(3,4)* have suggested that conservative management is a viable option. For men with low-grade, clinically localized disease and a life expectancy of fewer than 10 years, conservative management has been shown to be an acceptable alternative. Because of the lack of definitive evidence, no clear consensus exists on the selection of optimal treatment for clinically localized prostate cancer *(5)*. In choosing treatment options, men and their clinicians must also weigh the substantial risk of clinically significant complications of competing therapies *(6–10)*.

Prior research has identified demographic factors associated with treatment of clinically localized prostate cancer, including age at diagnosis, geographic region, comorbidity, and race *(11–15)*. No prior study has comprehensively assessed key clinical factors (such as prostate-specific antigen [PSA], Gleason score, and baseline urinary and sexual functions) and nonclinical factors (such as sociodemographic and economic variables) in a population-based sample. Any of these factors may affect the selection of treatments. To investigate patterns of therapy in a population-based sample of men with prostate cancer, we examined the influence of these factors on patterns of treatment in the four major management options (radical prostatectomy, radiation therapy, hormonal therapy, and watchful waiting) received by men diagnosed with clinically localized prostate cancer.

Materials and Methods

Data -

We analyzed data from patients who were participants in the National Cancer Institute (NCI)–sponsored Prostate Cancer Outcomes Study (PCOS). PCOS was initiated in 1994 to describe the diagnosis, the initial therapy and its determinants, the quality of life, and the subsequent treatment for recurrence and/or progression of prostate cancer. Methodologic details of the study have been reported elsewhere *(16)*.

Patients with newly diagnosed prostate cancer were identified within 4 months of initial pathologic diagnosis with systems used by the six participating registries (the states of Connecticut, New Mexico, and Utah and the metropolitan areas of Atlanta, GA, Los Angeles, CA, and Seattle, WA, of the NCI's Surveillance, Epidemiology, and End Results [SEER][1] Program). Men with a first primary prostate cancer diagnosed from October 1, 1994, through October 31, 1995, who were younger than 90 years, were eligible for the study. Men were asked to complete a survey 6 months after their diagnosis of prostate cancer. All men who completed a 6–month questionnaire and those who did not actively refuse to complete the 6–month survey were asked to complete the 12–month survey. Of the 5672 men sampled, 3533 (62%) participated by completing a 6–month survey, a 12–month survey, or both. Participants were similar to nonparticipants with respect to mean age, 67.5 years ± 11.3 years (standard deviation) (range, 39–89 years) and 70.2 years ± 12.2 years (range, 43–89 years), respectively; tumor stage; and grade. Nonparticipants were more often nonwhite and from geographic areas with lower median incomes, although these differences were not large *(16)*. For this analysis, we excluded 47 men with a missing medical records abstract and 413 men diagnosed with clinically advanced disease (T3 and T4), defined as a positive scan, metastatic disease, or disease reported clinically as extending beyond the prostatic capsule, leaving a total sample size of 3073 patients.

Because the primary aims of this study were to investigate quality of life and patterns of therapy in a population–based sample of men with prostate cancer and because we were concerned about patient and physician burden, we believed that it was necessary to survey patients at 6 months rather than to attempt a survey before the initiation of therapy and again at 6 months. The self–administered PCOS patient survey conducted at 6 and 12 months included questions about symptoms; urinary, bowel, and sexual functioning; and comorbidity *(17)*. The 6–month survey also included questions about sociodemographic and economic status; symptoms; and urinary, bowel, and sexual functioning before the diagnosis of prostate cancer. In addition, after written consent was obtained from the patient, medical records were abstracted by trained medical record abstractors in facilities where the patient received treatment (e.g., the

physician's offices, radiation facilities, and hospitals) *(17)*. Detailed information on symptoms, clinical stage, Gleason grade *(18)*, PSA values, diagnostic tests, and treatments was recorded.

Initial therapy, abstracted from the medical records, was defined as treatment received in the first 6 months after diagnosis. A hierarchical variable was created to quantify treatment, ranging from the most aggressive therapy to the least aggressive. Men who received a radical prostatectomy were assigned to the prostatectomy category, whether or not they received any other adjuvant therapy, such as radiation therapy or hormonal therapy. Those men who received radiation therapy were categorized as having radiation therapy, whether or not they also received hormonal therapy. Men who were included in the hormone category consisted of those who received only hormonal therapy (medical or surgical), and men who had no reported therapy in the first 6 months after diagnosis were in the watchful-waiting group. Subsequent therapies given 6 months after diagnosis were excluded from the analysis because our goal was to examine factors related to selection of initial therapy.

We created a clinical stage variable that was based on an algorithm using clinical information, diagnostic tests, and biopsy results abstracted from inpatient and outpatient records. A patient assigned to clinical stage T1 had no positive scans, no metastatic disease, no abnormal or suspicious digital rectal examinations, a PSA level of less than 20 ng/mL, and disease reported from clinical examination as confined to the prostate or of unknown extension *(19)*. Patients assigned to T2 had no positive scans and no metastatic disease or disease reported clinically as confined to the prostate or of unknown extension. These patients had one or both of the following test results: unknown, abnormal, suspicious digital rectal examinations, or a PSA level of 20 ng/mL or more. Lymph node status was not considered in assigning clinical stage, because men who undergo surgery would be much more likely to have lymph nodes sampled and their disease upstaged *(20)*.

Comorbid conditions were identified from the patient survey, which queried respondents about the presence of 12 major chronic conditions hypothesized by the PCOS investigators to influence prostate cancer treatment choice and outcomes. A comorbidity score ranging from 0 to 12 was constructed from the responses to these items. If the respondent reported only that a doctor had told him that he had arthritis, diabetes, chronic lung disease, heart failure, hypertension, heart attack, chest pain, gastric ulcers, or depression but had no limitations in daily activities or if the respondent took no prescription medication, then nothing was added to his comorbidity score. For each of these nine conditions, a report of limitation of activity and/or of use of prescription medication added one point to the comorbidity score. Because of the probability that the remaining three conditions (stroke, inflammatory bowel disease, or liver

disease) substantially influenced the selection of therapy, one point was added to the comorbidity score, even when no medication or limitation of activity was reported.

Respondents were asked on the 6-month survey about urinary, bowel, and sexual function "just before prostate cancer" was diagnosed and about their function "during the past month." To assess the accuracy of 6-month retrospective recall of urinary, bowel, and sexual function, we conducted a validation study in a convenience sample of 133 men recruited in urologists' offices *(21)*. These patients were asked to complete the PCOS survey first at diagnosis and before treatment of prostate cancer and then again 6 months later. There was high overall agreement between prediagnostic sexual, bowel, and bladder function. However, men participating in the validation were younger, had higher educational levels and higher incomes, and were more likely to have a radical prostatectomy. These characteristics may limit the generalizability of the validation study.

Statistical Analysis

In bivariate analysis, we examined the association between the four major treatment types and the following clinical information: stage, PSA level at diagnosis, Gleason score, results of digital rectal examination, urinary symptoms, urinary infection, weight loss or anorexia, fatigue, bone pain, other symptoms, and comorbidity score. We also investigated the association between treatment and the sociodemographic variables of age at diagnosis, race/ethnicity, marital status, number of individuals living in the home, educational level, income, insurance coverage, and geographic location. In addition, we explored the relationship among urinary, bowel, and bladder functions before therapy; the patient-physician discussion of therapy options; and the therapy selected.

Descriptive analyses were conducted by use of SAS (SAS Institute, Inc., Cary, NC), and multiple logistic regression models were performed by use of the Survey Data Analysis statistical computer package (Research Triangle Institute, Research Triangle Park, NC) to compute the appropriate variances on the basis of the PCOS survey design. The Horvitz-Thompson weight, which, in this case, was calculated as the inverse of the sampling proportion for each PCOS sampling stratum (defined by age, race, and/or study area), was used to obtain estimates. The data presented in the tables, graphs, and the multiple logistic regressions are weighted to reflect all of the eligible prostate cancer patients in the PCOS study areas. The outcome variables were bivariate, aggressive versus conservative management, in the logistic regression models and were radiation therapy versus radical prostatectomy in the second model. We determined *a priori* that the independent variables entered in the logistic models would be those statistically significantly associated with initial therapy in the bivariate analyses, by use of statistical significance level of .05. We examined statistical interactions of

significance level of .05. We examined statistical interactions of age and race, age and comorbidity, and race and several comorbid conditions in our multivariate models. Only the interaction of age and race was statistically significantly associated with aggressive versus conservative therapy.

Results of the logistic regression models are shown as adjusted percentages of patients receiving the treatment of interest, according to each of the independent variables. The logistic regression models were used to generate these estimates of the probability for each individual (or predicted values from the models) receiving the treatments, according to each independent variable. The percentages in each group were then directly standardized to the distribution of the covariates among the weighted sample used in each model *(22)*. The odds ratio for the statistical interaction term was calculated by combining the interaction between age and race with the main effects for age and race. All statistical tests were two-sided.

RESULTS

For patients with clinically localized disease, radical prostatectomy was the most frequently selected therapy overall (47.6%), followed by radiation therapy (23.4%), watchful waiting (18.5%), and hormonal therapy (10.5%). Clinical factors were associated with treatments used for men diagnosed with clinically localized prostate cancer in bivariate analyses (Table 1⇔). We found a statistically significant ($P \leq .001$) difference in treatment selection between men with clinical stage T1 and T2 disease. For clinical stage T1 disease, 52.4% underwent a radical prostatectomy and, for stage T2, only 45.7% underwent this surgery. Hormonal therapy alone was received more frequently by patients at stage T2 than at stage T1 (12.7% versus 5.2%). More than one half of the men with PSA levels of less than 10 ng/mL received a radical prostatectomy compared with 20.6% of the men with PSA levels of more than 50 ng/mL. The proportion of men receiving radical prostatectomy decreased to less than 50% when the Gleason score was 7 or higher or was unknown. In general, the presence of pretreatment disease symptoms and more comorbidity were related to increasingly less aggressive treatments.

View this table:
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Table 1.
Distribution of tumor characteristics and symptoms at diagnosis by initial therapy*

Table 2⇔ shows the distribution of selected sociodemographic and economic characteristics among the four initial treatments. Patient age at diagnosis was an important determinant of therapy, with 79.3% of the men younger than 60 years at diagnosis having a radical prostatectomy, but the proportion of men receiving hormonal therapy or watchful waiting increased

men receiving hormonal therapy or watchful waiting increased substantially with age for men 75 years old and older, with 57.9% of the men aged 75–79 years and 82.1% of the men aged 80 years old and older receiving hormonal therapy or watchful waiting. Men 75 years old and older were also more likely to receive conservative therapy than either radical prostatectomy or radiation therapy. In addition, race/ethnicity, marital status, number living in the home, educational level, income, insurance coverage, and geographic region also were related to treatments received. Hispanic men received radical prostatectomy more often than non-Hispanic whites or African-Americans ($P \leq .001$), and radical prostatectomy was received less frequently by patients with lower educational levels and incomes.

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Table 2. Distribution of sociodemographic and economic characteristics by initial therapy*

Poorer pretreatment urinary, bowel, and sexual functions were associated with less aggressive treatments (Table 3⇔). Patients who received radical prostatectomy reported less baseline incontinence or impotence than did patients who received other therapies. Men who reported being sexually impotent before treatment were also less often treated with surgery compared with potent men. In men who were younger than age 70 years at diagnosis, 71.0% without impotence received a radical prostatectomy compared with 53.3% who reported being impotent. This observation also was true for men 70 years old and older.

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Table 3. Distribution of function and treatment discussed by age and initial therapy*

As might be expected, the therapy selected was related to the type of therapy discussed with the physician. Those patients not discussing aggressive therapy were less likely to receive it. In the younger age group, 58.6% of those receiving watchful waiting had a discussion about aggressive and conservative therapies, and in the older age groups, 54.8% discussed both aggressive and conservative therapies.

Table 4⇔ shows the adjusted percentage distributions for the variables that were statistically significantly associated with treatments in multiple logistic regression models. First, among all of the patients with clinically localized prostate cancer, conservative therapy was associated with unmarried status, geographic location, a high PSA level, history of heart attack, baseline impotence or poor bladder control, and no reported discussion of an aggressive therapy option (Table 4⇔). A

difference in the effect of age by race/ethnicity group was observed. Similar proportions of white, African-American, and Hispanic men younger than 60 years of age received aggressive therapy (adjusted percentages = 85.5%, 88.1%, and 85.3%, respectively). However, there was a decrease in the proportion of African-American men 60 years old and older who received aggressive therapy (adjusted percentages for men aged 60–64 years = 67.1%, 65–74 years = 64.8%, and ≥75 years = 25.2%) relative to white men (adjusted percentages for men aged 60–64 years = 84.7%, 65–74 years = 73.4%, and ≥75 years = 45.7%), but no difference between white and Hispanic men (adjusted percentages for men aged 60–64 years = 79.2%, 65–74 years = 79.5%, and ≥75 years = 36.6%) was observed.

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Table 4.
Adjusted percentage (Adj. %) distributions for patients with clinically localized prostate cancer to receive therapy

Among only those men receiving aggressive therapies, we next examined factors associated with the use of radical prostatectomy versus radiation therapy (Table 4⇔). After adjustment for clinically significant characteristics, such as PSA level and comorbidity, age was positively associated with radiation therapy. In the youngest age group, men younger than 60 years, 13.9% (adjusted percentages) received radiation therapy, whereas 70.5% (adjusted percentages) of men 75 years old and older received radiation therapy. Regional differences also emerged, with men living in Atlanta (36.4% = adjusted percentage) or Connecticut (43.4% = adjusted percentage) being more likely to receive radiation therapy than men residing in the other four areas. Non-Hispanic white and African-American men were equally likely (33.8% = adjusted percentage) and Hispanic men were less likely (25.8% = adjusted percentage) to receive radiation therapy after adjustment for other clinical and nonclinical factors.

Discussion

The choice of initial treatment for clinically localized prostate cancer is difficult for both the physician and patient, given the scientific uncertainties about the relative efficacy of each therapeutic strategy. We found substantial variations in the treatments used across regions and in population subgroups. Although such variations do not necessarily indicate poor or inappropriate treatments, they raise important questions. Do all men with clinically localized prostate cancer have access to all treatment options? Are they informed of the potential risks and benefits? Are clinicians providing information about all options to their patients?

We found that treatment patterns were related partly to prognostic factors, such as the baseline PSA value and Gleason score (Table 1⇔), known determinants of outcome *(23,24)*. When the PSA level was more than 50 ng/mL, men were more likely to be treated conservatively. The distribution of therapy by PSA level suggests that some older patients who have aggressive forms of cancer and are poor surgical candidates receive hormonal therapy rather than radiotherapy. Higher PSA levels may also raise concerns about clinically inapparent spread of the disease, which is treated with hormonal therapy to delay possible metastatic progression.

We observed that 10.5% of the men with clinically localized prostate cancer received hormonal therapy only. The reason for hormonal therapy at this time is unclear, given the lack of definitive evidence that hormonal therapy is effective against early-stage prostate cancer. Perhaps hormonal therapy is given because some patients with favorable prognostic factors prefer to do something other than watching and waiting. For other patients at higher risk of progression, as reflected by a high level of PSA or a high Gleason score, the goal of hormonal therapy may be to delay progression to metastatic prostate cancer. Some of these patients, especially older men and those with other comorbidities, may be poor surgical candidates and may wish to avoid the potential complications associated with radiation therapy. This observation is supported by the finding that men with a history of heart attack were more likely to be treated conservatively, 36.6% (adjusted percentage) of men with a history of heart attack versus 28.3% (adjusted percentage) of men without such a history.

We observed that age at diagnosis was inversely associated with the proportion of men receiving aggressive treatment, consistent with results in previous studies *(11,13)*. Age is generally considered to be a key prognostic factor in treatment decision making, perhaps as important as PSA level and Gleason score. Given the long natural history of localized prostate cancer, the majority of older men with prostate cancer will die of other causes *(4,25)*. Furthermore, because radical prostatectomy and radiation therapy have potential serious long-term complications *(9,10, 26)*, the tendency for older men to be treated more conservatively may be reasonable and appropriate.

Unmarried men in the current study were more often treated conservatively than married men, even after adjustment for age and other factors, 33.1% versus 27.9%. Other studies have reported similar findings. Married patients with lung cancer more often were treated surgically *(27)*, and married women with breast cancer more often had definitive therapy *(28)*. Unmarried men have poor survival from a variety of diseases and may have other physical and psychologic health issues that prohibit aggressive treatment or may lack emotional support and encouragement to select aggressive therapy for their cancer *(29)*

The geographic variation in therapies that we found suggests a lack of consensus among physicians, particularly in the absence of evidence on the relative outcomes of competing therapies *(30,31)*. We observed statistically significant ($P \leq .001$) regional variations in treatments, with a range of 18.8%–37.4% of the patients receiving conservative treatment across the six regions studied. Such variations across geographic regions have been noted previously *(11,13,32)*. Urban–rural differences in treatments of other cancers have also been observed, possibly associated with distance to treatment facilities *(27,28)*. However, the urban–rural disparity was not apparent in our data. Little difference in treatment practices was observed in Los Angeles and New Mexico, and men in Utah received aggressive therapy more frequently than men in Los Angeles.

As the comorbidity score increased in this study, men were statistically significantly more likely to receive radiation therapy rather than radical prostatectomy, even after adjustment for other variables (Table 4⇔), confirming previous results *(12,33)*. Men with clinically significant medical conditions are not candidates for radical prostatectomy, which carries nontrivial risks of acute complications *(34)*.

To our knowledge, this is the first study of prostate cancer treatment patterns to include measurements of prediagnostic disease–related urinary, bowel, and sexual functions. A new finding is that pretreatment impotence and poor bladder control emerged as statistically significant independent determinants of the treatment received (Table 4⇔). We found that such men were more likely to receive conservative therapy, even after adjustment for other variables, including age and comorbidity. Perhaps, men and their clinicians may avoid aggressive therapies that may exacerbate an existing problem to minimize further losses in function, or perhaps these problems exist more often in men with other diminished functions that we did not measure.

After adjustment for clinical factors, the use of conservative treatment did not appear to be associated with income, educational level, or insurance coverage. In our study, among men 60 years old and older, African–American men were more likely to be treated conservatively than white men, consistent with previous reports *(11–13,35)*. Although previous studies have found a difference in aggressive versus conservative therapy, Demark-Wahnefried et al. *(15)* reported that, stage for stage, African–American (n = 117) and white (n = 114) men participating in their study received comparable treatment. However, their study population was younger (average age, 64.7 years), and men older than 74 years were excluded. Indeed, we found no difference in the treatment, conservative or aggressive, given to African–American and white men younger than 60 years. When comparisons were made within the group receiving aggressive therapy, although there were differences by age, the

selection of radiation therapy or radical prostatectomy was not different for African-American (33.8% = adjusted percentage) and white (33.8% = adjusted percentage) men. However, when aggressive and conservative therapies were compared, it was unclear why older African-American men in our study received less aggressive therapy than white men. Demark-Wahnefried et al. *(15)* also queried men about which treatment options were discussed. They observed that white men were somewhat more likely to discuss each of the listed treatment options with their physicians. Our data are not strictly comparable. After adjustment for a number of clinical and socioeconomic variables, including educational level and income, our data suggest that African-American men were more likely to have discussed both aggressive and conservative treatments but that white men were more likely to have discussed only aggressive therapies (data not shown). Possible reasons for the differences in the treatment patterns include variables that we did not measure, such as patient preferences, poorer access to physician specialists, bias in referral patterns, or physician recommendations for treatment, or some other variable, such as attitudes toward the medical system.

Most previous studies of treatment for prostate cancer *(11,13,35)* have been hospital based or lacked information on multiple patient clinical and health factors that may affect the selection of treatments. This study includes extensive information collected from hospital charts, physician records, and patients. However, certain limitations remain.

Although the current study provides detailed information on the therapy given, functional status, and coexisting illnesses, we do not have information about the process of decision making in the selection of therapy. We do have information regarding the types of therapies discussed, which suggests that a discussion that includes only the aggressive therapy option strongly influences treatment choice toward more aggressive therapy. However, it remains difficult to clearly delineate the extent to which the decision for specific treatments is influenced by the physician's recommendation and by patient preferences that are, in turn, based on a complex set of expectations, desire for specific outcomes, and fear of particular complications. Because men completed the surveys 6 months after diagnosis, our study has the potential for recall bias; thus, future surveys may wish to track the discussion and decision-making process more closely in time to the discussion. Clearly, the primary goal for most patients remains cure. Research into the complex dynamics of decision making about treatment of prostate cancer requires better understanding of the patients' perception of the trade-offs between quantity and quality of life. This information will be critical in guiding future research into the underlying patient, provider, and health system factors that may influence patterns of care.

In summary, we found that, in addition to prognostic factors (such as age and PSA value), baseline disease-related function (such as impotence and bladder control), nonclinical variables, and marital status are important determinants of treatment of clinically localized prostate cancer. These results showing the variation in treatment by geographic region and other nonclinical factors underscore the lack of consensus for care of this disease, probably attributable to the lack of definitive evidence of the efficacy of one approach versus another. Until such evidence can be obtained, we urge that men diagnosed with prostate cancer be informed of the potential risks and the potential benefits of all four main treatment options so that they might make an informed decision.

Acknowledgments

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Footnotes

[1] *Editor's note:* SEER is a set of geographically defined, population-based, central cancer registries in the United States, operated by local nonprofit organizations under contract to the National Cancer Institute (NCI). Registry data are submitted electronically without personal identifiers to the NCI on a biannual basis, and the NCI makes the data available to the public for scientific research.

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Patient and Treatment Factors Associated With Complications After Prostate

Patient Compliance to Radiation for Advanced Head and Neck Cancer at a Tertiary Care County Hospital[†]

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Keywords:
Head and neck cancer; county hospitals; radiation; organ preservation; compliance

Abstract

Background: Combined chemotherapy and radiotherapy are routinely used to treat advanced-stage head and neck squamous cell carcinoma (HNSCC). Patient compliance is often difficult given increased toxicities. Medically underserved or uninsured patients may lack the necessary support to complete such treatment.

Objective: To evaluate compliance to radiation therapy for patients with advanced stage HNSCC at an urban tertiary-care county hospital.

Study Design: Retrospective review.

Methods: Data were extracted from the charts of 136 consecutive patients who had been advised to undergo chemoradiotherapy for newly diagnosed HNSCC from 2004 to 2006. Demographic and tumor-related information was collected, as was patient compliance with radiation treatment. Total dose, length of treatment, and theoretical "loss of loco-regional control" was calculated. Benchmark compliance data were obtained from select publications.

Results: Of 136 patients, 55 did not begin treatment or transferred care elsewhere, leaving 81 study patients. Twenty-eight patients (35%) had unacceptable overall treatment courses. Forty-eight patients (59%) received less than the effective dose of 65 Gy after accounting for missed treatment days. Fifty-one patients (63%) had a greater than 10% calculated loss in loco-regional control. Univariate and multivariate analysis yielded no predictive value for gender, ethnicity, node status, stage, or primary site on compliance.

Conclusion: Compared with other institutions, HNSCC patients in this setting are less likely to complete a prescribed therapeutic regimen. Patient and tumor characteristics measured in this study do not predict compliance. Organ preservation protocols require further evaluation in populations where compliance is suspect. Future research must examine interventions to improve compliance and assessment of its impact on survival.

Tab 1

Patient Compliance with Radiation Therapy Treatment Requirements

Patient or "Therapeutic Compliance" has long been a concern in medicine and public health:

> "The ultimate aim of any prescribed medical therapy is to achieve certain desired outcomes in the patients concerned. These desired outcomes are part and parcel of the objectives in the management of the diseases or conditions. However, despite all the best intention and efforts on the part of the healthcare professionals, those outcomes might not be achievable if the patients are non-compliant. This shortfall may also have serious and detrimental effects from the perspective of disease management. Hence, therapeutic compliance has been a topic of clinical concern since the 1970s due to the widespread nature of non-compliance with therapy."[i]

The excerpt is taken from a 2008 meta-study of research on patient compliance performed over a 30 year period from 1975 to 2005. This study seeks to identify the various ways that patients fail to adhere to treatment requirements and the underlying reasons for this behavior. In the course of this review, the authors categorize various types of reported non-compliance as follows:

Table 1 Type of reported non-compliance

Type of non-compliance	Reference
Receiving a prescription but not filling it	Donovan and Blake 1992
Taking an incorrect dose	
Taking medication at the wrong times	
Increasing or decreasing the frequency of doses	
Stopping the treatment too soon	
Delaying in seeking healthcare	Vermeire et al 2001
Non-participation in clinic visits	
Failure to follow doctor's instructions	Gordis 1979
"Drug holidays", which means the patient stops the therapy for a while and then restarts the therapy	Cummings et al 1982;Vermeire 2001
"White-coat compliance", which means patients are compliant to the medication regimen around the time of clinic appointments	Cramer et al 1990; Feinstein 1990; Vermeire 2001; Burnier et al 2003

Virtually all of these forms of non-compliance are of concern in cancer care. "Stopping the treatment too soon" is of special concern in chemotherapy and radiation therapy regimens. These treatments are designed to deliver specially calibrated doses of therapeutics over a given period of time. Missed appointments or early termination interfere with the effectiveness of these treatments.

The authors of this study also identify a variety of underlying causes for non-compliance. These are identified in the table below.

Table2 Categories of factors identified from the literature review

Category	Factors
Patient-centered factors	Demographic Factors: *Age, Ethnicity, Gender, Education, Marriage Status*
	Psychosocial factors: *Beliefs, Motivation, Attitude*
	Patient-prescriber relationship
	Health literacy
	Patient knowledge
	Physical difficulties
	Tobacco Smoking or alcohol intake
	Forgetfulness
	History of good compliance
Therapy-related factors	Route of administration
	Treatment complexity
	Duration of the treatment period
	Medication side effects
	Degree of behavioral change required
	Taste of the medication
	Requirements for drug storage
Healthcare system factors	Lack of accessibility
	Long waiting time
	Difficulty in getting prescriptions filled
	Unhappy clinic visits
Social and economic factors	Inability to take time off work
	Cost and Income
	Social support
Disease factors	Disease symptoms
	Severity of the disease

Given longstanding concern with patient compliance generally, frequent lack of compliance with cancer treatment regimens is not unexpected. Cancer, for example is generally considered to be a severe disease and often presents with extreme, persistent symptoms. Cancer treatment such as chemo-therapy and radiation therapy frequently has painful and distressing side effects and generally occurs over an extended duration of weeks or months. These therapies are also associated with high cost. As the tables above demonstrate all of these factors (underlined) are associated with compliance failure.

Special interest in patient compliance for cancer care emerged in the late 1980's in response to disparities in breast cancer treatment and in particular regarding the use of Breast Conservation Therapy (BCT) vs. mastectomy. Despite the fact that the research had established an equivalency in the effectiveness of these therapies, unexplained variations in their use persisted.[ii] Many women continued to be treated by mastectomy when less invasive BCT was a viable, even more effective alternative. Investigations of this phenomenon revealed several underlying reasons including the desire on the part of some patients to avoid the difficulties associated with extended radiation treatment.

One recent seminal study of this issues is Impact of Patient Distance to Radiation Therapy on Mastectomy Use in Early-Stage Breast Cancer Patients. [iii] This study was conducted in Virginia with data on more than 20,000 women treated for breast cancer between 1996 and 2000. Forty-three percent of these women were treated by mastectomy and fifty-three by lumpectomy (with the remaining four percent unknown). Two factors made this situation ideal for the study of the impact of travel

distance on the use of radiation therapy. The first reason is that radiation therapy is necessary component of BCT but less so with mastectomy. The second reasons is that radiation treatment capacity expanded in Virginia by five new installations during the study period. Travel distance to radiation therapy was therefore reduced for much if the population over the five year course of the research, Researchers were therefore able to assess the extent to which travel distance affected the choice between optimal and suboptimal treatment alternatives. The researchers found as follows:

> "In multivariate analysis, mastectomy use was independently influenced by XRT distance after adjusting for age, race, T stage, and diagnosis year. Over the study period, mastectomy rates declined from 48% to 43% across Virginia, and there were similar declines in a 15-mile area around four new radiation facilities in urban settings. However, mastectomies decreased from 61% to 45% around a new XRT facility in a rural setting."

Similar findings have been noted in other studies:

> "The treatment of breast cancer has advanced considerably in the last two decades due to earlier detection, improved techniques for staging, development of alternative surgical approaches and radiation technologies, and coordination of multidisciplinary teams to implement multi-faceted treatment programs [1,2]. With the shift from mastectomy to breast-conserving surgery has come the reliance on post-operative adjuvant radiation therapy as an integral part of the local treatment regimen to the breast [3-5]. However, studies have shown that some patients opt for a mastectomy rather than lose time from family or work traveling to a distant radiation facility and/or undergoing a lengthy radiation treatment such as with conventional whole breast irradiation (WBI) [6-9]. The development of several techniques of accelerated partial breast irradiation (APBI) provides an alternative to WBI that reduces treatment time from weeks to days [6,10-12]".[iv]

Such studies demonstrate that distance to radiation therapy increases the likelihood of suboptimal treatment choices by patients, their physicians or both. Other studies demonstrate a level of persistent failure to obtain radiation therapy for breast cancer even for BCT:

> "After adjustment for age, the likelihood of receiving radiotherapy following BCS decreased significantly with increasing travel distance to the nearest radiation-treatment facility.... The likelihood of receiving radiotherapy after BCS increased slightly with travel distance to approximately 10 miles, then declined steadily at greater distances."[v]

> "Results: Full compliance (defined as completion of the entire course of radiation therapy and clinical follow-up) with the BCT program was observed in only 36% of patients. Fifteen of the 35 noncompliant patients did not complete radiation therapy. A significantly higher local failure rate

was observed: 8 of these 15 patients (53%) have had local failure. In contrast, patients who were either in full compliance with the BCT program or were deficient only in that they missed part of their clinical follow-up had local failure rates of 5% (1/20) and 10% (2/20), respectively. Age, race, stage of cancer, economic status (measured by availability of medical insurance), distance of patient's residence from the hospital, and education level were evaluated as potential predictors of compliance. None predicted patient compliance, although a trend toward higher compliance was noted in patients with a higher education level, as determined by literacy testing."[vi]

While not all of these studies detect a correlation between non-compliance and distance to treatment, they repeatedly demonstrate frequent problems with compliance and suggest that every practical step should be taken to facilitate and simplify patient access to these services.

Concern over compliance with treatment requirements is not restricted to breast cancer. This issue has been an important area of research for other frequently occurring types of cancer as well. The following excerpt is from a study that examined the effect of non-clinical factors on the choice of therapies (including radiation therapy) for prostate cancer:

"The geographic variation in therapies (for prostate cancer) that we found suggests a lack of consensus among physicians, particularly in the absence of evidence on the relative outcomes of competing therapies. We observed statistically significant (P !.001) regional variations in treatments, with a range of 18.8%–37.4% of the patients receiving conservative treatment across the six regions studied. Such variations across geographic regions have been noted previously. Urban–rural differences in treatments of other cancers have also been observed, possibly associated with distance to treatment facilities."[vii]

Similar concerns have long existed with respect to other frequently occurring cancers including lung cancer the most frequently occurring form of the disease throughout the country.

" We reviewed 1808 hospital charts representing virtually all patients given a diagnosis of non-small-cell lung cancer in New Hampshire and Vermont between 1973 and 1976 and found that the treatment of patients varied according to their marital status, medical insurance coverage, and proximity to a cancer-treatment center. Patients were more likely to be treated with surgery if they were married (odds ratio, 1.67; 95 percent confidence interval, 1.08 to 2.57) or had private medical insurance (1.52; 1.03 to 2.26). Among patients who did not have surgery, those with private insurance were more likely to receive another form of anticancer therapy--either radiation or chemotherapy (1.57; 1.18 to 2.09). Residing farther from a cancer-treatment center was associated with a greater chance of having surgery."[viii]

In addition to assessing the reasons for compliance failures in cancer treatment, compliance research also examines the impact of compliance failure on outcomes. This is illustrated in one study already quoted above.[ix] It is demonstrated as well in the following excerpt from a study on compliance with chemotherapy and radiation therapy requirements for treatment of head and neck cancers:

> **"Results:** Of 136 patients, 55 did not begin treatment or transferred care elsewhere, leaving 81 study patients. Twenty-eight patients (35%) had unacceptable overall treatment courses. Forty-eight patients (59%) received less than the effective dose of 65 Gy after accounting for missed treatment days. Fifty-one patients (63%) had a greater than 10% calculated loss in loco-regional control. Univariate and multivariate analysis yielded no predictive value for gender, ethnicity, node status, stage, or primary site on compliance."[x]

The body of research on compliance with cancer treatment shows clearly that failure to comply with treatment requirements is a common problem. Despite the importance of these requirements patients often find them to arduous and difficult to fully meet. It is also clear that radiation therapy is among those treatments that are affected in this manner. While there are various factors that spur this phenomenon the issue of distance to treatment is frequently found to be a influential factor. Given the importance of radiation therapy to patient outcomes, careful consideration must be given to geographical distribution in the development of facilities and patients should have access to options close to home to the maximum extent practicable.

Implications for Rhode Island

As pointed out in The Cyberknife Report, radiation therapy facilities in Rhode Island are concentrated and not well distributed geographically. This may be an important element in understanding the apparent underuse of radiation therapy in comparison with the rest of the country as described in response to question 7. As further demonstrated in the application, the minimum distance to treatment for residents of Bristol is 15 miles. The research discussed above indicates that compliance begins to be affected at approximately this level of travel.

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[i] Jing Jin, Grant Edward Sklar, Vernon Min Sen Oh; "Factors affecting therapeutic compliance: A review from the patient's perspective"; Therapeutic Clinical Risk Management, 2008 February; 4(1): 269–286.

[ii] Lantz, Zemencuk & Katz; "Is Mastectomy Overused? A Call for an Expanded Research Agenda"; Health Services Research 2002 April; 37(2): 417–431.

iii Anneke T. Schroen, David R. Brenin, Maria D. Kelly, William A. Knaus and Craig L. Slingluff Jr, "Impact of Patient Distance to Radiation Therapy on Mastectomy Use in Early-Stage Breast Cancer Patients", Journal of Clinical Oncology (October 1, 2005) vol. 23 no. 28: 7074-7080

iv Dooley et al. World Journal of Surgical Oncology 2011, 9:30

v William F. Athas, Meg Adams-Cameron, William C. Hunt,Andrew Amir-Fazli, Charles R. Key; "Travel Distance to Radiation Therapy and Receipt of Radiotherapy Following Breast-Conserving Surgery" Journal of the National Cancer Institute, Vol. 92, No. 3, February 2, 2000

vi Ll, Benjamin D. L. MD; Brown, William A. MD; Ampil, Frederico L. MD; Burton, Gary V. MD; Yu, Herbert MD, PhD; McDonald, John C. MD; "Patient Compliance Is Critical for Equivalent Clinical Outcomes for Breast Cancer Treated by Breast Conservation Therapy" Annals of Surgery: June 2000 - Volume 231 - Issue 6 - pp 883-889

vii Linda C. Harlan, Arnold Potosky, Frank D. Gilliland, Richard Hoffman, Peter C. Albertsen, Ann S. Hamilton, J. W. Eley, Janet L. Stanford and Robert A. Stephenson; "Factors Associated With Initial Therapy for Clinically Localized Prostate Cancer: Prostate Cancer Outcomes Study", Journal of the National Cancer Institute I (2001) 93 (24): 1864-1871

viii Greenberg ER, Chute CG, Stukel T, Baron JA, Freeman DH, Yates J, Korson R.; "Social and economic factors in the choice of lung cancer treatment. A population-based study in two rural states." N Engl J Med. 1988 Mar 10;318(10):612-7.

ix See Li , above

x Urjeet A. Patel MD, Kunal H. Thakkar MD,Nathaniel Holloway MD; "Patient Compliance to Radiation for Advanced Head and Neck Cancer at a Tertiary Care County Hospital" The LaryngoscopeVolume 118, Issue 3, pages 428–432, March 2008

Exhibit 2

Population to be Served- Current Population								
Primary Service Area				**Secondary Service Area**				**Total**
	Bristol County, RI	**Newport County RI**	**Total PSA**	**Fall River, MA**	**Seekonk**	**Swansea**	**Total SSA**	
Population by Age Group:								
Under 5	2,195	4,062	6,256	5,776	933	1,031	7,740	13,996
5-17	7,980	12,350	20,330	13,151	2,104	314	15,568	35,899
18-64	31,371	52,385	83,757	57,135	8,723	14,248	80,105	163,862
65 & Above	8,329	14,091	22,420	12,795	1,962	273	15,030	37,450
Total Population	49,875	82,888	132,763	88,857	13,722	15,865	118,444	251,207
Below Poverty Line	6.50%	7.30%		22.8%	3.3%	3.1%		
Hispanic	2.00%	4.20%		12.4%	3.1%	3.0%		
Per Capita Income	$35,588	$36,994		$20,337	$ 37,827	$ 38,142		
Asian	1.40%	1.60%		2.80%	2.60%	2.64%		
Black	0.80%	3.50%		4%	3.40%	3.25%		
High School Graduates	86.20%	91.10%		68%	91.20%	90.20%		
Batchelor's Degree	41.10%	43.40%		14.10%	42.50%	42.30%		
Localities Included in County:								
	Barrington	Newport						
	Bristol	Portsmouth						
	Warren	Middletown						
		Tiverton						

Population to be Served Projected 2015								
Primary Service Area				**Secondary Service Area**				**Total**
	Bristol County, RI	**Newport County RI**	**Total PSA**	**Fall River, MA**	**Seekonk**	**Swansea**	**Total SSA**	
Population by Age Group:								
Under 5	2,175	3,988	6,163	5,658	962	1,031	7,651	13,814
5-17	7,944	12,128	20,072	12,883	2,169	323	15,375	35,447
18-64	31,089	51,709	82,798	55,969	8,993	14,229	79,192	161,990
65 & Above	8,317	14,070	22,386	12,534	2,023	281	14,839	37,225
Total Population	49,525	81,896	131,420	87,044	14,147	15,865	117,057	248,477
Localities Included in County:								
	Barrington	Newport						
	Bristol	Portsmouth						
	Warren	Middletown						
		Tiverton						

Source: US Bureau of the Census

Exhibit 3

Question 9

21st Century Oncology and all affiliated entities are committed to treating any patient in need. We will not turn anyone away, regardless of their insurance status or income. We are committed to the communities we serve and do our best to assist our patients in obtaining any and all assistance available to them. Our formal policy is below.

1. Policy & Purpose:
This policy is designed to provide charity care to those patients that cannot afford to pay and do not qualify for any federal, state or county programs that are available. The policy will apply to balances due from uninsured or underinsured patients with a patient balance in the amount of $1,000 or greater.

Underinsured is defined as patients with insurance that lacks sufficient coverage resulting in a financial responsibility 30% or greater than their annual gross income.

This policy assigns charity assistance according to 3 criteria; income, credit availability and family size. Income will be calculated using the most recent applicable items; paystub, social security statement, W-2, pension statement and/or alimony payments. To determine credit availability, all patients must be pre-screened through TransUnion prior to being approved for assistance. Family size will be determined by either a tax return or other supporting documentation. Charity adjustment is valid for all services rendered within 6 months of the approval date.

2. Scope:
This policy applies to Radiation Therapy Services, Inc., (RTSI), related party companies, all RTSI subsidiary companies, third-party companies and independent contractors.

Household Size		Up to 200% of poverty guidelines	Between 200-300% of poverty guidelines	Over 300% of poverty guidelines
1	Min	$0.00	$22,340.01	$33,510.01
	Max	$22,340.00	$33,510.00	+
2	Min	$0.00	$30,260.01	$45,390.01
	Max	$30,260.00	$45,390.00	+
3	Min	$0.00	$38,180.01	$57,270.01
	Max	$38,180.00	$57,270.00	+
4	Min	$0.00	$46,100.01	$69,150.01
	Max	$46,100.00	$69,150.00	+
5	Min	$0.00	$54,020.01	$81,030.01
	Max	$54,020.00	$81,030.00	+
6	Min	$0.00	$61,940.01	$92,910.01
	Max	$61,940.00	$92,910.00	+

PRESUMPTIVE CHARITY CARE CALCULATION WORKSHEET

ENTERED BY: _____

DATE: _____

Patient Name	
Patient Number	
Dataset/Location	
Patient DOB	
Diagnosis Code	
Plan Code	
Preparer	
Prepared Date	
Estimated Patient Responsibility	

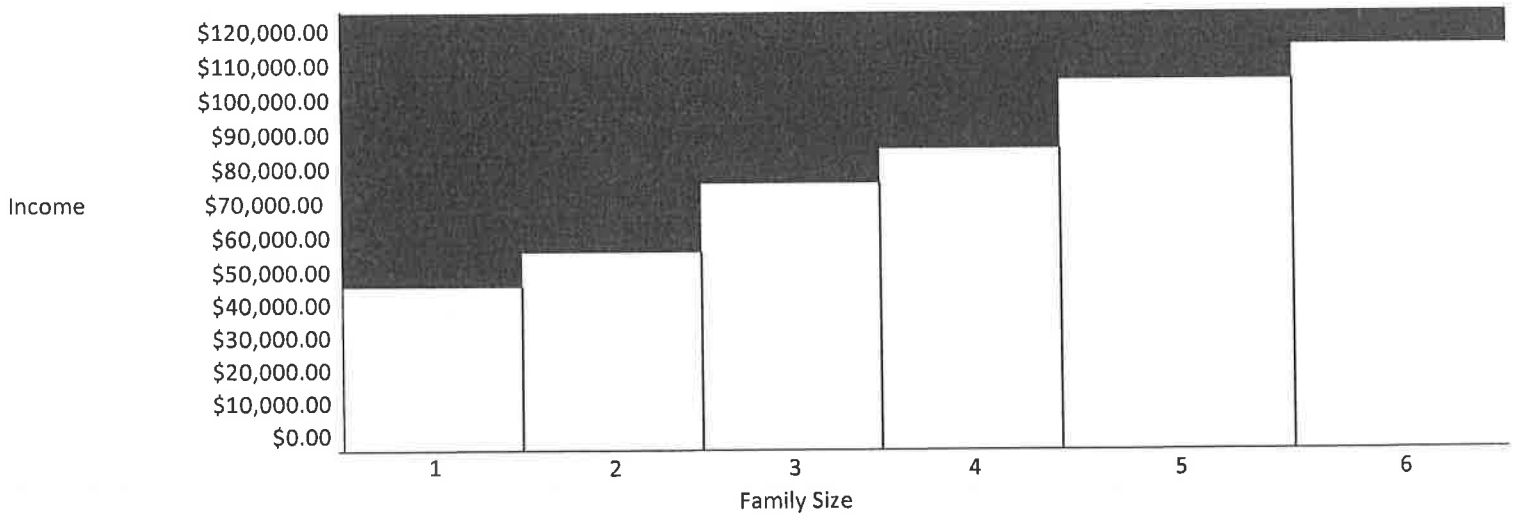
Patient Balance	
Date TU Ran	
TU Score	
Total Amount of Open Line of Credit	
OK to proceed with FH: Yes or No	

Source of Income	Monthly Gross Amount
Salary	
Social Security	
Other Income (Alimony, Pension)	

Is Patient Underinsured? ☐

Total Available Funds for TX _____

Family Size (consists of # of Dependents + Patient) _____



APPROVAL SIGNATURE _____ DATE _____

Form Date: 06/06/2012

LEGEND		100% Discount	50% Discount	No Discount
Family Size				
1		$ 22,340.00	$ 33,510.00	$ 33,510.01
2		$ 30,260.00	$ 45,390.00	$ 45,390.01
3		$ 38,180.00	$ 57,270.00	$ 57,270.01
4		$ 46,100.00	$ 69,150.00	$ 69,150.01
5		$ 54,020.00	$ 81,030.00	$ 81,030.01
6		$ 61,940.00	$ 92,910.00	$ 92,910.01

Form Date:06/06/2012

Exhibit 4

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

Form 10-K

(Mark One)

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the fiscal year ended December 31, 2011

or

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the transition period from to

Commission file number: 333-170812

RADIATION THERAPY SERVICES HOLDINGS, INC.

(Exact Name of Registrant as Specified in its Charter)

Delaware (State or Other Jurisdiction of Incorporation or Organization)	**26-1747745** (I.R.S. Employer Identification No.)
2270 Colonial Boulevard **Fort Myers, Florida** (Address Of Principal Executive Offices)	**33907** (Zip Code)

(239) 931-7275
(Registrant's Telephone Number, Including Area Code)

Securities registered pursuant to Section 12(b) of the Act: **None**

Securities registered pursuant to Section 12(g) of the Act: **None**

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☐ No ☒

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Exchange Act. Yes ☐ No ☒

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes ☒ No ☐

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or a smaller reporting company. See the definitions of "large accelerated filer," "accelerated filer" and "smaller reporting company" in Rule 12b-2 of the Exchange Act. (Check one):

Large accelerated filer ☐	Accelerated filer ☐	Non-Accelerated filer ☒ (Do not check if a smaller reporting company)	Smaller reporting Company ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes ☐ No ☒

None of the voting or non-voting common equity of the registrant is held by a non-affiliate of the registrant. There is no publicly traded market for any class of common equity of the registrant.

As of March 1, 2012, there were 1,025 shares of the registrant's common stock, $0.01 par value per share, issued and outstanding, all of which are 100% owned by Radiation Therapy Investments, LLC.

DOCUMENTS INCORPORATED BY REFERENCE: None.

TABLE OF CONTENTS

FORWARD LOOKING STATEMENTS

Some of the information set forth in this Annual Report on Form 10-K contains "forward-looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995. We may make other written and oral communications from time to time that contain such statements. Forward-looking statements, including statements as to industry trends, future expectations and other matters that do not relate strictly to historical facts are based on certain assumptions by management. These statement are often identified by the use of words such as "may," "will," "expect," "plans," "believe," "anticipate," "project," "intend," "could," "estimate," or "continue," "may increase," "may fluctuate," and similar expressions or variations, and are based on the beliefs and assumptions of our management based on information then currently available to management. Such forward-looking statements are subject to risks, uncertainties and other factors that could cause actual results to differ materially from future results expressed or implied by such forward-looking statements. Important factors that could cause actual results to differ materially from the forward-looking statements include, among others, the risks discussed herein under the heading "Risk Factors." We caution readers to carefully consider such factors. Further, such forward-looking statements speak only as of the date on which such statements are made and we undertake no obligation to update any forward-looking statement to reflect events or circumstances after the date of such statements.

PART I

Item 1. ***Business***

References in this Annual Report on Form 10-K to "we", "us", "our" and "the Company" are references to Radiation Therapy Services Holdings, Inc. and its subsidiaries, consolidated professional corporations and associations and unconsolidated affiliates, unless the context requires otherwise or unless indicated otherwise. References in this Annual Report on Form 10-K to "Parent" are references to Radiation Therapy Services Holdings, Inc. and not to its subsidiaries, consolidated professional corporations and associations and unconsolidated affiliates. References in this Annual Report on Form 10-K to "our treatment centers" refer to owned, managed and hospital based treatment centers.

Our Company

We are a leading provider of advanced radiation therapy services to cancer patients primarily in the United States. We offer a comprehensive range of radiation treatment alternatives, and focus on delivering academic-quality, cost-effective patient care in a personal and convenient setting. Our first radiation treatment center opened in 1983, and as of December 31, 2011, we owned or operated 127 treatment centers, 118 of which are freestanding facilities with the nine remaining facilities operated in partnership with hospitals and other groups. Our treatment centers, most of which operate under the *21st Century Oncology* brand, are strategically clustered in 28 local markets in 16 states and 30 treatment centers are operated in South America, Central America and the Caribbean and one center located in India. We hold market leading positions in most of our local markets.

We believe we are the largest company in the United States focused principally on providing radiation therapy, and we believe our size provides us with competitive advantages. We have significant clinical and technological resources available within our national network of local providers, which assist our physicians in accessing the latest advances in research and technology and in delivering the most effective treatments to our patients. Our nationwide presence also enables us to implement best practices and share new ideas and information across our network. We are able to leverage our scale by recruiting, developing and training key clinical personnel. For instance, we operate our own dosimetry and radiation therapy schools and have an affiliated physics program. These in-house capabilities, combined with senior physician leadership, a premier medical board and substantive training and mentoring programs, have allowed us to deliver superior and innovative patient care with the highest quality standards across our centers. Furthermore, our operational infrastructure and network's size affords advantages in areas such as purchasing, recruiting, billing and information systems.

Our operating philosophy is centered upon using the latest available and most advanced technology, and employing leading radiation oncologists to deliver a variety of treatment options to our patients in each local market. To implement this philosophy, we invest in new software and equipment with the goal of equipping each local market with state-of-the-art technology that facilitates better clinical results. Through the use of advanced tools we can improve therapeutic outcomes by precisely targeting cancerous cells and tumors while sparing healthy, surrounding tissues and organs. We are also able to adapt and refine treatments as tumors shrink or change position. We have continued to attract and retain talented physicians and staff by providing opportunities to work in an environment that has a clinical and research focus, superior end-to-end resources, and high quality patient care. In addition, in certain local markets we have integrated with physicians in closely related medical specialties in order to provide a continuum of care for cancer patients. We have organized our Company into nine regional reporting units by geographic locations. We have eight regional directors that report to our Senior Vice President, Director of Regional Operations. Each regional director is responsible for the overall performance of their respective regions.

We have built a national platform of treatment centers while increasing both the revenue and profitability of the Company. Since the beginning of 2003, we have internally developed 25 treatment

centers and acquired 68 existing treatment centers, and from 2008 to 2011, increased revenues at a compound annual growth rate of 9.0%. We believe that as our scale continues to increase, our network of collaborative care along with our operational and financial resources will not only differentiate us from many of our competitors, but will also enhance our attractiveness to patients, referral sources, potential employees and acquisition targets. For the year ended December 31, 2011, our total revenues were $644.7 million.

Radiation Therapy Services Holdings, Inc. is a Delaware corporation and was incorporated October 9, 2007. Our principal executive office is located at 2270 Colonial Boulevard, Fort Myers, Florida and our telephone number is (239) 931-7275.

Our Industry

According to industry experts, the United States radiation therapy market was estimated to be approximately $8 billion in 2010. The market's growth is driven by the increasing number of cancer diagnoses and the development and use of increasingly effective technologies that enable more types of cancer-related tumors to be treated with radiation therapy. The American Cancer Society estimated that approximately 1.6 million new cancer cases are expected to be diagnosed in the United States in 2012. As the U.S. population ages, the number of cancer diagnoses is expected to continue to increase, as approximately 77% of all cancers are currently being diagnosed in persons 55 years of age and older. Radiation therapy is a primary treatment method for cancer and, according to the American Society for Therapeutic Radiology and Oncology ("ASTRO"), nearly two-thirds of patients diagnosed with cancer receive radiation therapy during their illness. Radiation therapy's share of the cancer treatment market has increased as a result of new radiation therapy technologies that better target cancerous tumors and lead to fewer side effects as compared to other forms of treatment and to previous radiation therapy treatments.

Radiation therapy is used to treat the most common types of cancer, including prostate, breast and lung cancer. Radiation therapy uses high-energy particles or waves, such as x-rays, to destroy cancer cells by delivering high doses of radiation to the tumor through a special piece of equipment, known as a linear accelerator. In addition, when a cure is not possible, radiation therapy is often able to shrink tumors thereby reducing pressure or pain while also relieving other symptoms of the cancer to enhance a patient's quality of life.

Although the majority of cancer patients receive radiation therapy treatment, individuals diagnosed with cancer may also undergo surgery, chemotherapy and/or biological therapy. Physicians generally choose the appropriate treatment or combination of treatments based upon the type of cancer, its stage of development and where the cancer is located. Radiation therapy patients are usually referred to a treatment center or a radiation oncologist by urologists, breast surgeons, general oncologists and general surgeons, in addition to other sources.

Recent research and technological advances have produced new, advanced methods for radiation treatment. These advanced methods result in more effective treatments that deliver the necessary doses of radiation while minimizing the harm to healthy tissues that surround the tumor. This is accomplished by modulating the intensity across the tumor and reducing the amount of radiation leakage resulting in fewer side effects and complications as well as an enhanced quality of life. For instance, new stereotactic radiosurgery planning and equipment, combined with tumor tracking or respiratory gating techniques, allow cancers located in the lung and liver to be treated with significantly fewer high dose radiation treatments and higher control rates, which results in less dosage to normal lung or liver tissue and leads to fewer side effects than before. With the discovery of new, innovative means to deliver radiation therapy and the increasing awareness of advanced treatments with reduced side effects by patients and physicians, radiation therapy is expected to be a preferred method for treating cancer.

The radiation therapy market is highly fragmented. In 2010, there were over 2,200 locations providing radiation therapy in the U.S., of which approximately 960 were freestanding, or non-hospital based, treatment centers. Further, approximately 30% of freestanding treatment centers are affiliated with the largest four provider networks, which includes RTS.

Service and Treatment Offerings

We believe our radiation treatment centers are distinguishable from those of many of our competitors because we offer patients a full spectrum of radiation therapy alternatives, including many advanced treatment options that are not otherwise available in certain geographies or offered by other providers. Our radiation treatment services include external beam therapies, such as conformal beam treatment, intensity modulated radiation therapy and stereotactic radiosurgery, as well as internal radiation therapy such as high-dose and low-dose rate brachytherapy. In addition, we utilize various supplementary technologies, including image guided radiation therapy, Gamma Function, respiratory gating and 3-D conformal treatment planning to improve the effectiveness of the radiation treatments. Finally, we provide an array of complementary support services in the areas of psychological and nutritional counseling as well as transportation assistance, consistent with applicable regulatory guidelines. Radiation therapy is given in one of two ways: externally or internally, with some cancers treated utilizing both radiation therapy approaches.

External Beam Therapy. External beam radiation therapy involves exposing the patient to an external source of radiation through the use of special equipment that directs radiation at the cancer. Equipment utilized for external beam radiation therapy vary as some are better for treating cancers near the surface of the skin and others are better for treating cancers deeper in the body. A linear accelerator, the most common type of equipment used for external beam radiation therapy, can create both high-energy and low-energy radiation. High-energy radiation is used to treat many types of cancer while low-energy radiation is used to treat some forms of skin cancer. A course of external beam radiation therapy typically ranges from 20 to 40 treatments. Treatments generally are given to a patient once each day with each session lasting for approximately 15 minutes.

Internal Radiation Therapy. Internal radiation therapy also called brachytherapy, involves the placement of the radiation source inside the body. The source of the radiation (such as radioactive iodine) is sealed in a small holder called an implant and is introduced through the aid of thin wires or plastic tubes. Internal radiation therapy places the radiation source as close as possible to the cancer cells and delivers a higher dose of radiation in a shorter time than is possible with external beam treatments. Internal radiation therapy is typically used for cancers of the lung, esophagus, breast, uterus, thyroid, cervix and prostate. Implants may be removed after a short time or left in place permanently (with the radioactivity of the implant dissipating over a short time frame). Temporary implants may be either low-dose rate or high-dose rate. Low-dose rate implants are left in place for several days; high-dose rate implants are removed after a few minutes.

Since all of our treatment centers are clustered into local markets, our treatment centers are distinguished from those of many of our competitors by our ability to offer advanced radiation therapy services. Our advanced radiation treatment services include: image guided radiation therapy, intensity modulated radiation therapy, 3-D conformal treatment planning, stereotactic radiosurgery Gamma Function, respiratory gating and high-dose and low-dose rate brachytherapy.

The following table sets forth the forms of radiation therapy treatments and advanced services that we offer:

Technologies	Description
External Beam Therapy	
Conformal Beam Treatment . . .	Enables radiation oncologists to utilize linear accelerator machines to direct radiation beams at the cancer.
Intensity Modulated Radiation Therapy ("IMRT")	Enables radiation oncologists to adjust the intensity of the radiation dose and conform the beam along the entire surface of the tumor. IMRT can also be programmed to angle beams of radiation around normal tissue, thereby sparing healthy organs and reducing side effects.
Stereotactic Radiosurgery	Enables delivery of concentrated, precise, high dose radiation beams to localized tumors. Historically, stereotactic radiosurgery was used primarily for contained lesions of the brain but recent advancements in imaging technologies have allowed more types of tumors to be targeted, therefore broadening the use of stereotactic radiosurgery for extra-cranial cancers.
Internal Radiation Therapy	
High-Dose Rate Remote Brachytherapy	Enables radiation oncologists to treat cancer by internally delivering higher doses of radiation directly to the cancer.
Low-Dose Rate Brachytherapy .	Enables radiation oncologists to treat cancer by internally delivering lower doses of radiation directly to the cancer over an extended period of time (e.g., prostate seed implants).
Advanced Services Used with External Beam Treatment Therapies	
Image Guided Radiation Therapy ("IGRT")	Enables radiation oncologists to utilize imaging at the time of treatment to localize tumors and to accurately mirror the contour of a tumor from any angle.
Gamma Function	Proprietary capability that for the first time enables measurement of the actual amount of radiation delivered during a treatment. Gamma Function also enables us to verify radiation delivery and compare it to the physician prescription and treatment plans. Further, it provides the physician with information to adjust for changes in tumor size and location, and ensures immediate feedback for adaption of future treatments as well as for quality assurance.
Respiratory Gating	Coordinates treatment beam activation with the respiratory motion of the patient, thereby permitting accurate delivery of radiation dosage to a tumor that moves with breathing, such as lung and liver cancers.

Technologies	Description
3-D Conformal Treatment Planning	Permits accurate, 3-dimensional rendering of the tumor and surrounding normal organs in order to facilitate an efficient treatment plan maximizing radiation exposure of cancerous tissue and minimizing exposure of healthy tissue.

Conformal Beam Treatment. This technology allows the radiation oncologist to utilize a linear accelerator machine to direct radiation beams at the cancer. Utilization of specialized equipment and planning systems allow 3D computer images to be accessed to develop complex plans to deliver highly-conformed (focused) radiation while sparing normal adjacent tissue.

Intensity Modulated Radiation Therapy. With IMRT, radiation can be focused at thousands of pinpoints and delivered by varying levels of beam intensity directly to a tumor. Because IMRT uses variable intensity beams, it can be used to treat tumors to higher doses and better spare normal tissue. IMRT technology can be programmed to actually wrap and angle beams of radiation around normal tissue and organs, protecting healthy tissue as it destroys the tumor. As such, IMRT patients typically experience fewer side effects, which helps them to maintain their strength and lead more normal lifestyles during treatment.

Stereotactic Radiosurgery/Stereotactic Radiotherapy. Stereotactic radiosurgery/radiotherapy involves a single or a few intense high-dose fraction(s) of radiation to a small area. This form of therapy typically is used to treat tumors that cannot be treated by other means, such as surgery or chemotherapy. Precise calculations for radiation delivery are required. Treatment also requires extensive clinical planning and is provided in conjunction with the referring surgeon and under the direct supervision of a radiation oncologist and a physicist. Stereotactic radiosurgery often involves very careful immobilization of the patient. For example, cranial radiosurgery might involve the use of a neurosurgical head frame to assure precise tumor localization. With recent advances in imaging technologies, stereotactic radiosurgery can now be used to treat extra-cranial cancers to a higher dose with target localization and image verifications. These advances broaden the types of cancers that can be successfully treated with stereotactic radiosurgery.

Brachytherapy. Brachytherapy involves the use of surgical and fiberoptic procedures to place high-dose rate or low-dose rate sources of radiation in the patient's body. This technique is used for implantation of sources into the prostate, intraluminal therapy within the esophagus and endobronchial therapy within the lungs, among other places within the body. Prostate seed implants involve the permanent placement of radioactive pellets within the prostate gland.

High-Dose Rate Remote Brachytherapy. In high-dose rate remote brachytherapy, a computer sends the radioactive source through a tube to a catheter or catheters that have been placed near the tumor by the specialist working with the radiation oncologist. The radioactivity remains at the tumor for only a few minutes. In some cases, several remote treatments may be required, and the catheters may stay in place between treatments. High-dose rate remote brachytherapy is available in most of our local markets and patients receiving this treatment are able to return home after each treatment. This form of brachytherapy has been used to treat cancers of the cervix, breast, lung, biliary tree, prostate and esophagus. MammoSite® Radiation Therapy is used for partial breast irradiation and works by delivering radiation from inside the lumpectomy cavity directly to the tissue where the cancer is most likely to recur.

Low-Dose Rate Brachytherapy. We are actively involved in radioactive seed implantation for prostate cancer, the most frequent application of low-dose rate brachytherapy. There are several advantages to low-dose rate brachytherapy in the treatment of prostate cancer, including convenience to the patient as the patient generally can resume normal daily activities within hours

after the procedure. This procedure is performed by a team of physicians and staff with nearly a decade of experience in prostate brachytherapy. During the procedure, radioactive sources or "seeds" are inserted directly into the prostate, minimizing radiation exposure to surrounding tissues while permitting an escalation of the dose concentrated in the area of the cancer.

All of our markets provide external beam treatments and following is a list of the advanced services and treatments that we offer within each of our 28 domestic local markets as of December 31, 2011:

Local market	Year Established	Number of Centers	IMRT	3-D	Gamma	Gating	IGRT	Stereotactic		Brachytherapy	
								Cranial	Extra-Cranial	High Dose	Low Dose
Lee County—Florida	1983	7	✓	✓	✓	✓	✓	✓	✓	✓	✓
Charlotte/Desoto Counties—Florida	1986	1	✓	✓	✓	✓	✓	✓	✓	✓	
Sarasota/Manatee Counties—Florida	1992	5	✓	✓	✓	✓	✓	✓	✓	✓	
Collier County—Florida	1993	3	✓	✓	✓	✓	✓	✓	✓	✓	
Broward County—Florida	1993	7	✓	✓	✓	✓	✓	✓	✓	✓	
Miami/Dade County—Florida	1996	1	✓	✓	✓	✓	✓	✓	✓	✓	
Las Vegas, Nevada	1997	4	✓	✓	✓	✓	✓	✓	✓	✓	✓
Westchester/Bronx—New York	1997	3	✓	✓	✓		✓		✓	✓	
Mohawk Valley, New York	1998	2	✓	✓	✓		✓	✓	✓	✓	
Delmarva Peninsula	1998	3	✓	✓	✓		✓	✓	✓	✓	
Northwest Florida	2001	3	✓	✓	✓	✓	✓	✓	✓	✓	
Western North Carolina	2002	6	✓	✓	✓		✓	✓	✓	✓	✓
Palm Beach County—Florida	2002	1	✓		✓		✓			✓	
Central Kentucky	2003	4	✓	✓	✓	✓	✓	✓	✓	✓	
Florida Keys	2003	1	✓	✓	✓		✓	✓	✓	✓	
Southeastern Alabama	2003	2	✓	✓	✓	✓	✓	✓	✓	✓	
Central Maryland	2003	7	✓	✓	✓	✓	✓	✓	✓	✓	
South New Jersey	2004	4	✓	✓	✓		✓			✓	
Rhode Island	2004	4	✓	✓	✓		✓				
Central Arizona	2005	5	✓	✓	✓		✓	✓	✓	✓	✓
Central Massachusetts	2005	2	✓	✓	✓		✓				
Palm Springs, California	2005	4	✓	✓	✓	✓	✓	✓	✓	✓	✓
Los Angeles, California	2006	2	✓	✓	✓		✓		✓	✓	✓
Southeastern Michigan	2006	6	✓	✓	✓		✓	✓	✓	✓	
Northern California	2007	3	✓	✓	✓	✓	✓			✓	
Eastern North Carolina	2007	4	✓	✓	✓		✓		✓	✓	
Northeast Florida	2008	1	✓				✓		✓		
South Carolina	2010	1	✓	✓			✓	✓	✓		
		96									

All of our international markets provide external beam treatments and following is a list of the advanced services and treatments that we offer within international markets as of December 31, 2011:

Local market	Year Established	Number of Centers	IMRT	3-D	Gamma	Gating	IGRT	Stereotactic Cranial	Stereotactic Extra-Cranial	Brachytherapy High Dose	Brachytherapy Low Dose
India	2008	1	✓	✓							
Argentina	2011	23	✓	✓				✓	✓	✓	✓
Costa Rica	2011	2	✓	✓							
Dominican Republic	2011	2	✓	✓				✓		✓	
El Salvador	2011	1	✓	✓							
Guatemala	2011	1	✓	✓				✓			
Mexico	2011	1	✓	✓							
		31									

Advanced Services. We also offer advanced services, such as IGRT, Gamma Function testing, respiratory gating and conformal treatment planning.

Image Guided Radiation Therapy. This technology provides the radiation oncologist with a mechanism to achieve increased precision in radiation therapy targeting. The technique utilizes high-resolution x-rays, CT scans or ultrasound imaging to pinpoint internal tumor sites before treatment and overcomes the limitations of conventional skin marking traditionally used for patient positioning. IGRT represents the convergence of medical imaging and high precision external beam therapy.

Gamma Function. Gamma Function is a proprietary capability that for the first time enables measurement of the actual amount of radiation delivered during a treatment. This technology consists of an x-ray detector that measures the output of a radiation beam as it exits from the patient, and software that calculates the dose received by the patient from this output measurement. Additional software then performs a statistical comparison of the calculated dose with the planned radiation dose and notifies the radiation oncologist of any significant deviations between the treatment plan and the actual dose delivery. This provides the physician with information to adjust for changes in tumor size and location and ensures immediate feedback for adaption of future treatments as well as for quality assurance.

Respiratory Gating. This noninvasive technique allows radiation targeting and delivery to account for respiratory motion in the treatment of cancers in the lung and upper abdomen, protecting healthy structures while directing higher doses of radiation to the tumor. Respiratory gating matches radiation treatment to a patient's respiratory pattern. When a person breathes, the chest wall moves in and out, and any structures inside the chest and upper abdomen also move. In the past, when radiation beams were aimed at a target inside those areas of the body, movement had to be accounted for by planning a large treatment area. With respiratory gating, radiation treatment is timed to an individual's breathing pattern with the beam delivered only when the tumor is in the targeted area.

3-D Conformal Treatment Planning. 3-D conformal treatment planning and computer simulation produces an accurate image of the tumor and surrounding organs so that multiple radiation beams can be shaped exactly to the contour of the treatment area. Because the radiation beams are precisely focused, nearby normal tissue is spared from radiation. In 3-D conformal treatment planning, state-of-the-art radiation therapy immobilization devices and computerized dosimetric software are utilized so that CT scans can be directly incorporated into the radiation therapy plan.

Our Business Strengths

We believe that the following competitive strengths have allowed us to achieve and maintain our position as a leading provider of radiation therapy:

National Platform with Strong Local Market Positions—We currently serve patients in 28 local markets across 16 states, including Alabama, Arizona, California, Delaware, Florida, Kentucky, Maryland, Massachusetts, Michigan, Nevada, New Jersey, New York, North Carolina, South Carolina, Rhode Island and West Virginia and expanded into international markets including India, South America, Central America and the Caribbean. Most of our treatment centers are strategically clustered into regional networks (which we refer to as our local markets) in order to leverage our clinical and operational expertise over a larger patient population and maximize our investment in advanced technologies. For example, our local markets enable us to share scarce and expensive medical physicists, who are critical in the process of developing the radiation treatment plan for each patient as well as making sure the equipment is properly calibrated. We generally have two physicists at three to four treatment centers in each of our local markets (as opposed to in each treatment center) which increases resource utilization and provides enhanced treatment consistency. In addition, we are able to provide our patients with a full technological spectrum, including less common treatment alternatives, by equipping each of our local markets, as opposed to each treatment center, with the necessary technology and know-how and thus doing so on a more cost-effective basis. Our scale also allows us to serve as a center for leading clinical research and technological advances, which helps us attract and retain talented radiation oncologists, physicists and other professionals. Furthermore, our national platform, reputation, recruiting ability and market knowledge enable us to respond quickly and efficiently to new acquisition as well as internally developed ("de novo") opportunities. Since the beginning of 2003, we have acquired or developed 93 treatment centers and entered into 16 new local markets and expanded into international markets including India, South America, Central America and the Caribbean. Finally, our centralized approach to business functions such as purchasing, accounting, administration, billing and information technology enables us to leverage economies of scale in various direct and indirect costs.

Best in Class Clinical and Technological Platform—We believe that we have best in class technology, which allows us to provide the highest quality of care and clinically advanced treatment options to our patients. We periodically upgrade our equipment and technology, and we believe they will require minimal maintenance capital expenditures in the near future. We believe we are the market leader in the utilization of advanced technologies, such as IMRT, IGRT and our recently-developed Gamma Function. These technologies are more effective at treating many forms of cancer than other, older technologies such as conformal beam. Our continuous and early adoption of technology platforms has allowed us to implement and share technology and our knowledge across our centers very quickly and therefore enhance clinical expertise within the Company and the industry overall. Our Chief Technology Officer, who is certified in radiotherapy physics, has received numerous awards, serves as an adjunct professor and is a published author in a variety of fields and has spent 20 years in his current role with the Company managing 72 physicists in the domestic U.S. and an internal radiation equipment development and maintenance team. Our Senior Vice President of Clinical Operations has been with the Company for 10 years and is a leading radiation oncologist who conducts radiation therapy research projects, publishes professional journal articles and presents at national cancer treatment meetings. These members of management and the teams that they lead provide both technical and clinical expertise throughout our network, enhancing the level of patient care, safety, and quality control. We feel our clinical and technological platform provides us with a significant competitive advantage in attracting new professional talent, upgrading equipment and operations of acquired centers, and the opportunity to distinguish ourselves with referral sources, payers and patients.

Leading Radiation Oncologists—We have been successful in recruiting, acquiring practices from, and retaining radiation oncologists with excellent academic and clinical backgrounds who we believe have potential for professional growth. Our approximately 117 radiation oncologists in the domestic U.S. have an average of over 17 years of experience and we believe our most senior clinical leadership are regarded as industry leaders. As a physician-led organization, we value superior training, research capabilities and mentoring. In addition to being educated and trained at some of the world's most prestigious and well recognized medical training centers and universities, our physicians have held positions in radiation oncology's elite research institutes, societies and regulatory bodies. These institutions and societies include ASTRO, American College of Radiation Oncology ("ACRO"), Association of Freestanding Radiation Oncology Centers ("AFROC") and Radiation Therapy Oncology Group. Our clinical leadership also publishes frequently as academic contributors, having co-authored numerous white papers, radiation therapy research projects, and empirical studies in a wide range of international and domestic medical journals. We attract and retain our existing physicians by:

- offering them the opportunity to join an established team of leaders in the field of radiation oncology;
- enabling them to maximize clinical results through the sharing of best practices;
- providing them access to advanced technologies and resources, including superior clinical personnel;
- offering them the opportunity to develop expertise in advanced treatment procedures;
- enabling them to conduct research and encouraging them to publish their results;
- providing them with a vast history and amount of data to study protocols and outcomes of various treatment alternatives;
- providing them with the opportunity to earn above the national average compensation for radiation oncologists together with the benefits associated with an employment-based model; and
- offering them administrative and support services to assist in the management and operation of practices.

Favorable Industry Dynamics—Cancer treatment is a large and growing market. In 2008, there were approximately 12.0 million people living with cancer or with a history of cancer in the United States. The market has been growing, with approximately 1.6 million new cases expected to be diagnosed in the United States in 2012. Radiation therapy remains a core treatment for cancer with nearly two-thirds of cancer patients receiving radiation therapy during their illness. The U.S. radiation therapy market was estimated to be approximately $8 billion in 2010. We believe that several factors will contribute to the continued expansion of the cancer treatment market and increased utilization of radiation therapy as one of the primary treatment methods, including:

- the increased life expectancy and aging of the American population, which is likely to drive an increase in the incidence of the disease as approximately 77% of all cancers are diagnosed in persons 55 years of age and older;
- the advent of advanced radiation treatment technologies that expand the base of cancers that are treatable with radiation therapy;
- radiation therapy being less invasive than surgery;
- radiation therapy having fewer side effects than chemotherapy; and
- increasing patient knowledge and awareness of various treatment alternatives leading to higher utilization of advanced procedures that more effectively spare healthy tissue, reduce complications and side effects and improve quality of life.

Stable and Growing Business with Strong Operating Cash Flow—There are several underlying factors that we believe contribute to the stability and growing performance of our business; most notably, the aging of the U.S. population and resultant rise in cancer cases, and that radiation therapy remains a primary tool used to treat cancer. Additionally, our growth is attributable to our utilization of more advanced treatment technologies, which typically generates higher revenue growth and higher margins. In addition to stable and growing revenues, our base business includes characteristics that produce significant operating cash flow such as low operating costs and minimal working capital needs. The generation of operating cash flow allows us to either reinvest in our business through capital expenditures and growth initiatives and/or reduce indebtedness, each as determined by our business and financial strategies.

Strong Track Record of Successful Acquisitions and De Novo Facility Development—We have grown at a measured pace through a focused strategy of acquisitions and development of freestanding and hospital-based treatment centers. Since the beginning of 2003, we have acquired 68 treatment centers and have a successful track record of integrating our acquisitions as a result of our ability to leverage regional resources and technology, improve the mix of treatments, and put in place more favorable contracts for insurance and medical supplies that take advantage of our size. We have a deep corporate development team and unique market analysis software that enables us to proactively identify and prioritize acquisition targets based on demographics, payer landscape and competition, among other things. The radiation therapy market is highly fragmented. In 2010, approximately 30% of the market's freestanding centers are affiliated with the four largest provider networks, which includes Radiation Therapy Services, Inc. As a result, we believe our pipeline of potential targets is robust and acquisitions will remain a significant part of our core growth strategy. As a leading national platform company in the industry, we believe we are a preferred acquirer in light of the services and benefits we can offer.

Since the beginning of 2003, we have also developed 25 de novo treatment centers and we continue to seek opportunities to develop additional de novo treatment centers as a means to strengthen our local market share. De novo treatment centers allow us to penetrate underserved markets or extend our local network and typically require lower initial capital expenditures. De novo treatment centers typically generate positive cash flow within six months after opening in an existing market and twelve to fifteen months after opening in a new market.

Experienced and Committed Management Team and Equity Sponsor—Our senior management team, several of whom are practicing radiation oncologists, has extensive public and private sector experience in healthcare, in particular radiation oncology. Excluding our recently appointed Chief Financial Officer, our senior management team has been with us for an average of 14 years and averages approximately 17 years in the radiation therapy industry. Since 1999, members of our management team have helped to grow the Company from $56.4 million in total revenues to $644.7 million of total revenues for the year ended December 31, 2011. This growth has occurred both organically and through the integration of 105 treatment centers acquired since 1999. In addition, our equity sponsor, Vestar Capital Partners, Inc. ("Vestar"), has considerable experience making successful investments in a wide variety of industries, including healthcare.

Our Business Strategy

We believe we are in a superior position relative to our competitors to capitalize on the opportunities in our market given our size, market locations, access to capital and clinical expertise as well as our experienced physician base and management team. The key elements to our strategy are:

Maintain Emphasis on Service and Quality of Care—We focus on providing our patients with an environment that minimizes the stress and uncertainty of being diagnosed with and treated for cancer. We aim to enhance patients' overall quality of life by providing technologically advanced radiation treatment alternatives that deliver more effective radiation directly to cancerous cells while minimizing

harm to surrounding tissues and reducing side effects. As an example, one of our most recent technologies, Gamma Function, provides enhanced quality control during treatment delivery. Gamma Function effectively measures the radiation byproduct, or throughput, as the beam exits the body, thereby measuring the accuracy of the radiation delivery to the prescribed tumor site and giving the physician more frequent opportunities to re-design treatment plans during a course of an overall treatment regimen. Additionally, we verify every accelerator's output daily and voluntarily re-calibrate each machine annually using the services provided by the M.D. Anderson Radiation Physics Center at the University of Texas to ensure that our stringent quality control standards are met. We have a compliance program that is consistent with guidelines issued by the Office of Inspector General ("OIG") of the Department of Health and Human Services ("DHHS"). Our compliance team, led by a senior officer who has been with the Company since 2004, coupled with our in-house physics and maintenance departments, complements our front-end focus on employing the best physicians and using the most advanced technologies to provide our patients with superior care in a safe and quality-controlled environment.

Our treatment centers are designed to deliver high-quality radiation therapy in a patient-friendly environment and are generally located in convenient, community-based settings. We make every effort to see patients within 24 hours of a referral and to begin treatment as soon as possible thereafter. In addition, our radiation oncologists are available to patients at any time to discuss proposed treatments, possible side effects, and expected results of treatment. Finally, we offer support services in the areas of psychological and nutritional counseling as well as transportation assistance, consistent with applicable regulatory guidelines, each of which improves the patient experience. We believe our focus on patient service enhances the quality of care provided, differentiates us from other radiation therapy providers and strengthens our relationships with referring physicians.

Increase Revenue and Profitability of Our Existing Treatment Centers—We plan to continue to provide capital, support and technology to our existing centers to drive increased treatment volume, improve treatment mix, and leverage our strong market presence to generate operating efficiencies. We believe our scale and strategy of clustering treatment centers in local markets provide unique advantages for driving referrals, improving payer relationships and enhancing our clinical reputation, all of which lead to growth in patient volume. To drive increased operational efficiencies and increased profitability initiatives, in 2009 we refined our operating infrastructure to delineate between operating and clinical management at the senior management level. We now have eight domestic regional directors each with separate responsibility for business operations within their region. In concert with a newly revamped clinical board staffed with internal and external thought leaders in radiation oncology, this has allowed us to identify, measure and execute on opportunities for expense reduction and enhanced profitability. An example of one such initiative undertaken in 2009 was a more efficient approach to market optimization. Working with both the clinical and regional operations teams, we were able to recognize areas for improved technological coverage as well as identify a number of centers for closure as the existing patient volume could be serviced with a smaller, lower cost configuration of centers. Going forward, we believe this dual operating and clinical structure will not only continue to help us focus on increasing operating leverage but also more quickly facilitate the penetration of advanced technology and treatment methods across our centers, which enhances our overall treatment mix as newer technologies and treatments replace those that are older and less effective. We believe benefits resulting from leveraging our network of centers will continue to grow as we expand the platform through strategic acquisitions and internally developed treatment centers.

Continue to Lead in Clinical Excellence—For more than 20 years, we believe we have differentiated ourselves from other industry participants by proactively investing in a superior, research-driven clinical and technological infrastructure that has advanced our clinical treatment capabilities. As early as 1989, we founded, and still run, the only fully accredited privately-owned radiation therapy and dosimetry schools in the country. In addition, we have an affiliated physics program with the University of

Pennsylvania. As a result, we have recruited, trained, certified and retained many highly-talented medical physicists, dosimetrists and radiation therapists. Further, we have consistently invested in industry-leading and revolutionary technologies, through partnerships with renowned research institutes, proprietary experimental research entities and other for-profit businesses. We have also, through our own research initiatives and resources, developed and implemented treatment technologies exclusive to the Company. For example, Gamma Function (more fully described above) is an in-house developed software tool that we use to measure the quality of radiation therapy delivered to our patients. Currently, we are exploring more formalized initiatives to use our vast amount of data to lead and support studies and programs measuring quality outcomes of various treatment protocols.

Expand Through Acquisitions—Acquisitions are an important part of our expansion plan, and we have invested in unique tools and a substantial infrastructure to capitalize on acquisition opportunities. We will seek to enter new local markets and grow our existing markets through the acquisition of established treatment centers with leading radiation oncologists, meaningful local market share and significant growth prospects. The foundation of our acquisition strategy is the implementation of our proven operating model at each of our newly acquired treatment centers. This includes upgrading existing equipment and technologies where applicable, enhancing treatment mix, introducing advanced therapies and services, providing clinical expertise and enabling our new physicians and patients to access our broad network of centers, contracts and resources. For example, our existing physicians and clinical experts are often able to educate the physicians at our acquired centers on the clinical benefits of using advanced technologies such as IMRT and IGRT, thereby increasing the penetration of these services in the center's overall treatment mix and resulting in higher average revenue per treatment, increased profitability and improved patient care. We are currently considering a number of acquisition opportunities, some of which could be material.

Develop New Treatment Centers in Existing and New Markets—We plan to develop treatment centers to expand our existing local markets and selectively enter new local markets. As of December 31, 2011, we have two de novo treatment centers under development in the domestic U.S, including a replacement de novo treatment center and two de novo treatment centers under development in South America. We have significant experience in the design and construction of radiation treatment centers, having internally developed 25 treatment centers since the beginning of 2003. In 2009, we opened de novo treatment centers in Hammonton, New Jersey; Indio, California; Fort Myers, Florida; Southbridge, Massachusetts; Providence, Rhode Island and Yucca Valley, California, and in 2010, we opened de novo treatment centers in Pembroke Pines, Florida and Los Angeles, California. We evaluate potential expansion into new and existing local markets based on demographic characteristics, pre-existing relationships with physicians or hospitals, the competitive landscape and the payer and regulatory environments. Our newly-developed treatment centers typically achieve positive cash flow within six to fifteen months after opening, depending upon whether it is an existing or new market, and the use of third party organizations minimizes our up front capital requirements. We may also from time to time enter new local markets through strategic alliances and joint ventures.

Expand Through Affiliations with Other Oncologists and Specialists—In select local markets, it may be advantageous to affiliate with physicians in medical specialties that are not primarily focused on radiation oncology, but are involved in the continuum of care for cancer patients. We may pursue these affiliations when opportunities arise to provide our patients with a more comprehensive treatment team to better target and treat tumors. In these instances, we believe we can further strengthen both our clinical working relationships and our standing within the local medical community. We currently operate as an integrated cancer care practice in a limited number of our markets, principally with other oncologists, including gynecological, surgical oncologists, and urologists.

Operations

We have 29 years of experience operating radiation treatment centers. We have developed an integrated operating model, which is comprised of the following key elements:

Treatment Center Operations. Our treatment centers are designed specifically to deliver high-quality radiation therapy in a patient-friendly environment. A treatment center typically has one or two linear accelerators, with additional rooms for simulators, CT scans, physician offices, film processing and physics functions. In addition, treatment centers include a patient waiting room, dressing rooms, exam rooms and hospitality rooms, all of which are designed to minimize patient discomfort.

Cancer patients referred to one of our radiation oncologists are provided with an initial consultation, which includes an evaluation of the patient's condition to determine if radiation therapy is appropriate, followed by a discussion of the effects of the therapy. If radiation therapy is selected as a method of treatment, the medical staff engages in clinical treatment planning. Clinical treatment planning utilizes x-rays, CT imaging, ultrasound, PET imaging and, in many cases, advanced computerized 3-D conformal imaging programs, in order to locate the tumor, determine the best treatment modality and the treatment's optimal radiation dosage, and select the appropriate treatment regimen.

Our radiation treatment centers typically range from 5,000 to 12,000 square feet, have a radiation oncologist and a staff ranging between ten and 25 people, depending on treatment center capacity and patient volume. The typical treatment center staff includes: radiation therapists, who deliver the radiation therapy, medical assistants or medical technicians, an office financial manager, receptionist, transcriptionist, block cutter, file clerk and van driver. In markets where we have more than one treatment center, we can more efficiently provide certain specialists to each treatment center, such as physicists, dosimetrists and engineers who service the treatment centers within that local market.

Standardized Operating Procedures. We have developed standardized operating procedures for our treatment centers in order to ensure that our professionals are able to operate uniformly and efficiently. Our manuals, policies and procedures are refined and modified as needed to increase productivity and efficiency and to provide for the safety of our employees and patients. We believe that our standard operating procedures facilitate the interaction of physicians, physicists, dosimetrists and radiation therapists and permit the interchange of employees among our treatment centers. In addition, standardized procedures facilitate the training of new employees.

Coding and Billing. Coding involves the translation of data from a patient's medical chart to our billing system for submission to third-party payers. Our treatment centers provide radiation therapy services under approximately 60 different professional and technical codes, which determine reimbursement. Our Medical Director and Chief Compliance Officer along with our certified professional coders work together to establish coding and billing rules and procedures to be utilized at our radiation treatment centers providing consistency across centers. In each radiation treatment center, our certified coders are in charge of executing these rules and procedures with the trained personnel located at each treatment center. To provide an external check on the integrity of the coding process, we conduct internal audits and have also retained the services of a third-party consultant to review and assess our coding procedures and processes on a periodic basis. Billing and collection functions are centrally performed by staff at our executive offices.

Management Information Systems. We utilize centralized management information systems to closely monitor data related to each treatment center's operations and financial performance. Our management information systems are used to track patient data, physician productivity and coding, as well as billing functions. Our management information systems also provide monthly budget analyses, financial comparisons to prior periods and comparisons among treatment centers, thus enabling management to evaluate the individual and collective performance of our treatment centers. We

developed a proprietary image and text retrieval system referred to as the Oncology Wide-Area Network ("OWAN"), which facilitates the storage and review of patient medical charts and films. We periodically review our management information systems for possible refinements and upgrading. Our management information systems personnel install and maintain our system hardware, develop and maintain specialized software and are able to integrate the systems of the practices we acquire.

Maintenance and Physics Departments. We have established maintenance and physics departments which implement standardized procedures for the acquisition, installation, calibration, use, maintenance and replacement of our linear accelerators, simulators and related equipment, as well as to the overall operation of our treatment centers. Our engineers, in conjunction with manufacturers' representatives, perform preventive maintenance, repairs and installations of our linear accelerators. This enables our treatment centers to ensure quality, maximize equipment productivity and minimize downtime. In addition, the maintenance department maintains a warehouse of linear accelerator parts in order to provide equipment backup. Our physicists monitor and test the accuracy and integrity of each of our linear accelerators on a regular basis to ensure the safety and effectiveness of patient treatment. This testing also helps ensure that the linear accelerators are uniformly and properly calibrated. Independent machine verifications are done annually using the services provided by the M.D. Anderson Radiation Physics Center to confirm proper calibrations.

Total Quality Management Program. We strive to achieve total quality management throughout our organization. Our treatment centers, either directly or in cooperation with the appropriate professional corporation or hospital, have a standardized total quality management program consisting of programs to monitor the design of the individual treatment of the patient via the evaluation of charts by radiation oncologists, physicists, dosimetrists and radiation therapists and for the ongoing validation of radiation therapy equipment. Each of our new radiation oncologists is assigned to a senior radiation oncologist who reviews each patient's course of treatment through the patient's medical chart using our OWAN. Furthermore, the data in our patient database is used to evaluate patient outcomes and to modify treatment patterns as necessary to improve patient care. We also utilize patient questionnaires to monitor patient satisfaction with the radiation therapy they receive.

Clinical Research. We believe that a well-managed clinical research program enhances the reputation of our radiation oncologists and our ability to recruit new radiation oncologists. Our treatment centers participate in national cooperative group trials and we have a full-time, in-house research staff to assure compliance with such trials and to perform related outcome analyses. We maintain a proprietary database of information on over 129,000 patients. The data collected includes tumor characteristics such as stage, histology and grade, radiation treatment parameters, other treatments delivered and complications. This data can be used by the radiation oncologists and others to conduct research, measure quality outcomes and improve patient care. These research and outcome studies often are presented at international conferences and published in trade journals. Through 2011, our radiation oncologists have published more than 670 articles in peer reviewed journals and related periodicals.

Educational Initiatives. In 1989, we founded The Radiation Therapy School for Radiation Therapy Technology, which is accredited by the Joint Review Committee on Education in Radiologic Technology. The school trains individuals to become radiation therapists. Upon graduation, students become eligible to take the national registry examination administered by the American Registry of Radiologic Technologists. Radiation therapists are responsible for administering treatments prescribed by radiation oncologists and monitoring patients while under treatment. Since opening in 1989, the school has produced 138 graduates, 69 of whom are currently employed by us.

Recognizing a growing need for individuals trained in treatment planning, we founded a Training Program for Medical Dosimetry in 2005. A total of 20 trainees/prospective students have completed or are in the process of completing the program in dosimetry. As of December 31, 2011, 16 trainees have completed the program with one senior in progress and three students matriculated effective January 2012. Two students successfully passed the certifying exam administered by the Medical Dosimetry Certification Board in September 2011, with five eligible trainees scheduled to sit for the exam in March 2012. In June 2011, the program applied for initial accreditation via the Joint Review Committee on Education in Radiologic Technology (JRCERT; www.jrcert.org) effective with the matriculation in January 2012 of the four prospective students as members of the January 2012 - December 2012 class.

In addition, we have an affiliated physics program with the University of Pennsylvania.

Privacy of Medical Information. We focus on being compliant with regulations under HIPAA, regarding privacy, security and transmission of health information. We have implemented such regulations into our existing systems, standards and policies to ensure compliance.

Compliance Program. We have a compliance program that is consistent with guidelines issued by the OIG of the DHHS. As part of this compliance program, we adopted a code of ethics and have a full-time compliance officer at the corporate level. Our program includes an anonymous hotline reporting system, compliance training programs, auditing and monitoring programs and a disciplinary system to enforce our code of ethics and other compliance policies. It also includes a process for screening all employees through applicable federal and state databases of sanctioned individuals. Auditing and monitoring activities include claims preparation and submission and also cover issues such as coding, billing, regulatory compliance and financial arrangements with physicians. These areas are also the focus of our specialized training programs.

Treatment Centers

As of December 31, 2011, we owned, operated and managed 118 freestanding and nine hospital-based treatment centers in our 28 domestic local markets and our international markets of which:

- 38 were internally developed;
- 80 were acquired; and
- nine are hospital-based/other group.

Internally Developed. As of December 31, 2011, we operated 38 internally developed treatment centers located in Alabama, Arizona, California, Florida, Maryland, Massachusetts, Nevada, New Jersey, New York, Rhode Island and Mohali, India. In 2009, we developed new treatment centers in Hammonton, New Jersey; Indio, California; Fort Myers, Florida; Southbridge, Massachusetts; Providence, Rhode Island and Yucca Valley, California, and in the first half of 2010, we opened de novo treatment centers in Pembroke Pines, Florida and Los Angeles, California. In August 2011 we completed a replacement de novo radiation treatment facility in Alabama. Our team is experienced in the design and construction of radiation treatment centers, having developed 10 treatment centers in the past three years. Our newly-developed treatment centers typically achieve positive cash flow within six to fifteen months after opening. The following table sets forth the locations and other information

regarding each of our internally developed radiation treatment centers in our local markets as of December 31, 2011:

Treatment Center	Year
Lee County—Florida	
Broadway	1983
Cape Coral	1984
Lakes Park	1987
Bonita Springs	2002
Lehigh Acres	2003
Lee Cancer Center	2009
Charlotte/Desoto Counties—Florida	
Port Charlotte	1986
Sarasota/Manatee Counties—Florida	
Englewood	1992
Sarasota	1996
Venice	1998
Bradenton	2002
Lakewood Ranch	2008
Collier County—Florida	
South Naples	1993
North Naples	1999
Northwest—Florida	
Destin	2004
Crestview	2004
Miami-Dade County—Florida	
Aventura	2007
Palm Beach County—Florida	
West Palm Beach(1)	2002
Northeast—Florida	
Jacksonville	2008
Las Vegas, Nevada	
Henderson*	2000
Fort Apache*	2008
Central Maryland	
Owings Mills(2)	2003
Westchester/Bronx—New York	
Bronx/Lebanon*	2009
South New Jersey	
Hammonton	2009
Rhode Island	
Woonsocket(3)	2004
South County(4)	2005
Providence(5)	2007
Providence(6)	2009
Central Arizona	
Scottsdale	2007
Palm Springs, California	
Palm Desert*	2005
Rancho Mirage*	2008
Yucca Valley*	2009
Indio*	2009

Treatment Center	Year
Central Massachusetts	
Southbridge(7)*	2009
Los Angeles, California	
El Segundo*	2010
International—India	
Mohali(8)	2008
Broward County—Florida	
Pembroke Pines	2010
Southeastern Alabama	
Andalusia	2011

* These radiation therapy treatment centers are operated through an administrative services agreement.

(1) We own a 50.0% ownership interest in the limited liability company (LLC) that provides radiation oncologists and operates the treatment center; we also provide physics and dosimetry services to the LLC.

(2) We have a 90.0% ownership interest in this treatment center.

(3) We have a 62.0% ownership interest in this treatment center.

(4) We have a 65.0% ownership interest in this treatment center.

(5) We have a 51.0% ownership interest in this treatment center.

(6) We have a 45.0% ownership interest in this treatment center.

(7) We have a 72.5% ownership interest in this treatment center.

(8) We have a 50.0% ownership interest in this treatment center.

Acquired Treatment Centers. As of December 31, 2011, we operated 80 acquired treatment centers located in Alabama, Arizona, California, Florida, Kentucky, Maryland, Massachusetts, Michigan, Nevada, New Jersey, New York, North Carolina, South Carolina and West Virginia, including 30 acquired treatment centers in South America, Central America and the Caribbean. Over the past three years, we have acquired 35 treatment centers of which none were acquired in 2009, two were acquired in 2010 and 33 in 2011. We plan to continue to enter new markets through the acquisition of established treatment centers from time to time. As part of our ongoing acquisition strategy, we continually evaluate potential acquisition opportunities.

The following table sets forth the locations and other information regarding each of the acquired radiation treatment centers in our local markets and international markets as of December 31, 2011:

Treatment Center	Year
Broward County—Florida	
Plantation	1993
Deerfield Beach	1994
Coral Springs	1994
Tamarac	1999
Collier County—Florida	
South Naples	2008
Northwest Florida	
Fort Walton Beach	2001
Florida Keys	
Key West	2003
Las Vegas, Nevada	
Las Vegas (2 locations)*	2005
Westchester/Bronx—New York	
Riverhill*	1998
Delmarva Peninsula	
Berlin, Maryland	1998
Salisbury, Maryland	2007
Western North Carolina	
Clyde*	2002
Brevard*	2002
Franklin*	2002
Marion*	2002
Rutherford*	2002
Park Ridge*	2003
Central Kentucky	
Danville	2003
Louisville(1)	2003
Frankfort	2003
Southeastern Alabama	
Dothan	2003
South New Jersey	
Woodbury	2004
Voorhees	2004
Willingboro	2004
Central Maryland	
Martinsburg, West Virginia(2)*	2005
Greenbelt, Maryland	2005
Belcamp, Maryland	2005
Bel Air, Maryland	2006
Fairlea, West Virginia	2008
Princeton, West Virginia	2010
Central Arizona	
Casa Grande	2007
Sun City (2 locations)	2008
Phoenix	2008

Treatment Center	Year
Central Massachusetts	
Holyoke*	2005
Los Angeles, California	
Santa Monica*	2006
Southeastern Michigan	
Pontiac*	2006
Madison Heights*	2006
Clarkson*	2006
Monroe*	2006
Macomb*	2006
Farmington Hills*	2006
Northern California	
Redding (2 locations)(3)*	2007
Mt. Shasta(3)*	2008
Eastern North Carolina	
Greenville*	2007
Goldsboro and Sampson*	2011
South Carolina	
Myrtle Beach	2010
Argentina (23 locations)	2011
Costa Rica (2 locations)	2011
Dominican Republic (2 locations)	2011
El Salvador	2011
Guatemala	2011
Mexico	2011

* These radiation therapy treatment centers are operated through an administrative services agreement.

(1) We have a 90.0% ownership interest in this treatment center.

(2) We have a 60.0% ownership interest in this treatment center.

(3) We have a 57.3% ownership interest in this treatment center.

Hospital-Based and Other Group Treatment Centers. As of December 31, 2011, we operated seven hospital-based treatment centers and two centers with outside groups. We provide services at all of our hospital-based treatment centers pursuant to written agreements with the hospitals. At the Florida treatment center, we provide the services of our radiation oncologists to the outside group and receive the professional fees charged for such services. We also provide physics and dosimetry services on a fee-for-service basis. We also manage these treatment centers pursuant to an agreement with the hospital. A professional corporation owned by certain of our equityholders provides the radiation oncologists for the treatment centers in Mohawk Valley—New York. In connection with our hospital-based treatment center services, we provide technical and administrative services. Professional services in New York are provided by physicians employed by a professional corporation owned by certain of our officers, directors and equityholders. Professional services consist of services provided by radiation oncologists to patients. Technical services consist of the non-professional services provided by us in connection with radiation treatments administered to patients. Administrative services consist of services provided by us to the hospital-based center. The contracts under which the hospital based treatment centers are provided service are generally three to seven years with terms for renewal. The following table sets forth the locations and other information regarding each of our hospital-based radiation treatment centers in our local markets as of December 31, 2011:

Treatment Center	Year	Professional	Technical	Administrative
Lee County—Florida				
Lakes Park(1)	2008	✓	✓	
Westchester/Bronx—New York				
Northern Westchester(2)	2005		✓	✓
Mohawk Valley—New York				
Utica(2)	1998	✓	✓	✓
Rome(2)	1999	✓	✓	✓
Delmarva Peninsula				
Seaford, Delaware(3)	2003		✓	✓
Eastern North Carolina				
Kinston	2007	✓		
Kentucky				
London, Kentucky	2011	✓	✓	✓
Broward County—Florida				
Broward General Hospital	2011	✓		✓
North Broward Hospital	2011	✓		✓

(1) We have a 90.0% ownership interest in this center.

(2) Professional services are provided by physicians employed by a professional corporation owned by certain of our officers and directors. Our wholly-owned New York subsidiary contracts with the hospital through an administrative services agreement for the provision of technical and administrative services.

(3) Professional services are provided by physicians employed by a professional corporation owned by certain of our officers and directors. Our wholly-owned Maryland subsidiary contracts with the hospital through an administrative services agreement for the provision of technical and administrative services.

Treatment Center Structure

Arizona, Florida, Kentucky, Maryland, New Jersey and Rhode Island Treatment Centers. In Arizona, Florida, Kentucky, Maryland, New Jersey and Rhode Island we employ or contract with radiation oncologists and other healthcare professionals. Substantially all of our Florida, Kentucky, Maryland, New Jersey and Rhode Island radiation oncologists have employment agreements or other contractual arrangements with us. While we exercise legal control over radiation oncologists we employ, we do not exercise control over, or otherwise influence, their medical judgment or professional decisions. Such radiation oncologists typically receive a base salary, fringe benefits and may be eligible for an incentive performance bonus. In addition to compensation, we provide our radiation oncologists with uniform benefit plans, such as disability, retirement, life and group health insurance and medical malpractice insurance. The radiation oncologists are required to hold a valid license to practice medicine in the jurisdiction in which they practice and, with respect to inpatient or hospital services, to become a member of the medical staff at the contracting hospital with privileges in radiation oncology. We are responsible for billing patients, hospitals and third-party payers for services rendered by our radiation oncologists. Most of our employment agreements prohibit the physician from competing with us within a defined geographic area and prohibit solicitation of our radiation oncologists, other employees or patients for a period of one to two years after termination of employment.

California, Delaware, Massachusetts, Michigan, Nevada, New York and North Carolina Treatment Centers. Many states, including California, Delaware, Massachusetts, Michigan, Nevada, New York and North Carolina prohibit us from employing radiation oncologists. As a result, we operate our treatment centers in such states pursuant to administrative services agreements between professional corporations and our wholly-owned subsidiaries. In the states of California, Delaware, Massachusetts, Michigan, Nevada, New York and North Carolina, our treatment centers are operated as physician office practices. We typically provide technical services to these treatment centers in addition to our administrative services. For the years ended December 31, 2009, 2010 and 2011 approximately 23.6%, 22.1% and 18.0% of our net patient service revenue, respectively, was generated by professional corporations with which we have administrative services agreements. The professional corporations with which we have administrative services agreements in California, Delaware, Massachusetts, Michigan, Nevada, New York and North Carolina are owned by certain of our directors, physicians and equityholders, who are licensed to practice medicine in the respective state.

Our administrative services agreements generally obligate us to provide certain treatment centers with equipment, staffing, accounting services, billing and collection services, management, technical and administrative personnel and assistance in managed care contracting. Our administrative services agreements provide for the professional corporations to pay us a monthly service fee, which represents the fair market value of our services. It also provides for the parties to meet annually to reevaluate the value of our services and establish the fair market value. In California and Nevada, we are paid a fee based upon a fixed percentage of global revenue. In Michigan, we are paid a fee based upon a fixed percentage of net income. In New York and North Carolina, we are paid a fixed fee per procedure. The terms of our administrative services agreements with professional corporations range from 10 to 25 years and typically renew automatically for additional five-year periods. Under related agreements in certain states, we have the right to designate purchases of shares held by the physician owners of the professional corporations to qualified individuals under certain circumstances.

Our administrative services agreements contain restrictive covenants that preclude the professional corporations from hiring another management services organization for some period after termination. The professional corporations are parties to employment agreements with the radiation oncologists. The terms of these employment agreements typically range from three to five years depending on the physician's experience.

Networking

Our radiation oncologists are primarily referred patients by: primary care physicians, medical oncologists, surgical oncologists, urologists, pulmonologists, neurosurgeons and other physicians within the medical community. Our radiation oncologists are expected to actively develop their referral base by establishing strong clinical relationships with referring physicians. Our radiation oncologists develop these relationships by describing the variety and advanced nature of the therapies offered at our treatment centers, by providing seminars on advanced treatment procedures and by involving the referring physicians in those advanced treatment procedures. Patient referrals to our radiation oncologists also are influenced by managed care organizations with which we actively pursue contractual agreements.

Employees

As of December 31, 2011, we employed approximately 2,900 employees, including approximately 680 employees in our international markets. As of December 31, 2011, we were affiliated with 117 radiation oncologists in the domestic U.S. that were employed or under contract with us or our affiliated professional corporations. We do not employ any radiation oncologists in California, Delaware, Massachusetts, Michigan, Nevada, New York or North Carolina due to the laws and regulations in effect in these states. None of our employees in our U.S. domestic markets are a party to a collective bargaining agreement and we consider our relationships with our employees to be good. Approximately 370 employees in our international markets are covered by a collective bargaining agreement with the Health Care Providers union corresponding to the agreement N° 108/75. The agreement does not have a fixed term, although payment increase is negotiated every year by the labor union. There currently is a nationwide shortage of radiation oncologists and other medical support personnel, which makes recruiting and retaining these employees difficult. We provide competitive wages and benefits and offer our employees a professional work environment that we believe helps us recruit and retain the staff we need to operate and manage our treatment centers. In addition to our radiation oncologists, we currently employ in the domestic U.S., 83 urologists, 31 surgeons and surgical oncologists, 16 medical oncologists and four gynecological and other oncologists, three pathologists, a pulmonologist and four primary care physicians whose practices complement our business in eight markets in Florida as well as our Arizona, North Carolina and Michigan local markets.

Seasonality

Our results of operations historically have fluctuated on a quarterly basis and can be expected to continue to fluctuate. Many of the patients of our Florida treatment centers are part-time residents in Florida during the winter months. Hence, these treatment centers have historically experienced higher utilization rates during the winter months than during the remainder of the year. In addition, volume is typically lower in the summer months due to traditional vacation periods. 30 of our 127 radiation treatment centers are located in Florida.

Insurance

We are subject to claims and legal actions in the ordinary course of business. To cover these claims, we maintain professional malpractice liability insurance and general liability insurance in amounts we believe are sufficient for our operations. We maintain professional malpractice liability insurance that provides primary coverage on a claims-made basis per incident and in annual aggregate amounts. Our professional malpractice liability insurance coverage is provided by an insurance company owned by certain of our directors, executive officers and equityholders. The malpractice insurance provided by this insurance company varies in coverage limits for individual physicians. The insurance company also carries excess claims-made coverage through Lloyd's of London. In addition, we currently maintain multiple layers of umbrella coverage through our general liability insurance policies. We maintain Directors and Officers liability insurance.

Competition

The radiation therapy market is highly fragmented and our business is highly competitive. Competition may result from other radiation oncology practices, solo practitioners, companies in other healthcare industry segments, large physician group practices or radiation oncology physician practice management companies, hospitals and other operators of other radiation treatment centers, some of which may have greater financial and other resources than us. We believe our radiation treatment centers are distinguishable from those of many of our competitors because we offer patients a full spectrum of radiation therapy alternatives, including many advanced treatment options that are not otherwise available in certain geographies or offered by other providers, and which are administered by highly trained personnel and leading radiation oncologists.

Intellectual Property

We have not registered our service marks or any of our logos with the United States Patent and Trademark Office. However, some of our service marks and logos may be subject to other common law intellectual property rights. We do not hold any patents. Recently, we filed an application to own the rights to a copyright that protects the content of our Gamma Function software code and are awaiting a registration certificate.

To date, we have not relied heavily on patents or other intellectual property in operating our business. Nevertheless, some of the information technology purchased or used by us may be patented or subject to other intellectual property rights. As a result, we may be found to be, or actions may be brought against us alleging that we are, infringing on the trademark, patent or other intellectual property rights of others, which could give rise to substantial claims against us. In the future, we may wish to obtain or develop trademarks, patents or other intellectual property. However, other practices and public entities, including universities, may have filed applications for (or have been issued) trademarks, patents or other intellectual property rights that may be the same as or similar to those developed or otherwise obtained by us or that we may need in the development of our own intellectual property. The scope and validity of such trademark, patent and other intellectual property rights, the extent to which we may wish or need to acquire such rights and the cost or availability of such rights are presently unknown. In addition, we cannot provide assurance that others will not obtain access to our intellectual property or independently develop the same or similar intellectual property to that developed or otherwise obtained by us.

Government Regulations

The healthcare industry is highly regulated and the federal and state laws that affect our business are extensive and subject to frequent changes. Federal law and regulations are based primarily upon the Medicare and Medicaid programs, each of which is financed, at least in part, with federal money. State jurisdiction is based upon the state's authority to license certain categories of healthcare professionals and providers, the state's interest in regulating the quality of healthcare in the state, regardless of the source of payment, and state healthcare programs. The significant federal and state regulatory laws that could affect our ability to conduct our business include without limitation those regarding:

- false and other improper claims;
- HIPAA;
- civil monetary penalties law;
- privacy, security and code set regulations;
- anti-kickback laws;
- the Stark Law and other self-referral and financial inducement laws;

- fee-splitting;
- corporate practice of medicine;
- anti-trust;
- licensing; and
- certificates of need.

A violation of these laws could result in significant civil and criminal penalties, the refund of monies paid by government and/or private payers, exclusion of the physician, the practice or us from participation in Medicare and Medicaid programs and/or the loss of a physician's license to practice medicine. We exercise care in our efforts to structure our arrangements and our practices to comply with applicable federal and state laws. We have a Medicare Compliance Committee and a Corporate Compliance Program in place to review our practices and procedures. Although we believe we are in material compliance with all applicable laws, these laws are complex and a review of our practices by a court, or law enforcement or regulatory authority could result in an adverse determination that could harm our business. Furthermore, the laws applicable to us are subject to change, interpretation and amendment, which could adversely affect our ability to conduct our business. No assurance can be given that we will be able to comply with any future laws or regulations.

We estimate that approximately 44%, 48% and 48% of our net patient service revenue for 2009, 2010 and 2011, respectively, consisted of reimbursements from Medicaid and Medicare government programs. In order to be certified to participate in the Medicare and Medicaid programs, each provider must meet applicable conditions of participation and regulations of the DHHS relating to, among other things, the type of facility, operating policies and procedures, maintenance of equipment, personnel, standards of medical care and compliance with applicable federal, state and local laws. Our radiation treatment centers are certified to participate in the Medicare and Medicaid programs.

Federal Law

The federal healthcare laws apply in any case in which we are providing an item or service that is reimbursable under Medicare or Medicaid. The principal federal laws that affect our business include those that prohibit the filing of false or improper claims with the Medicare or Medicaid programs, those that prohibit unlawful inducements for the referral or generation of business reimbursable under Medicare or Medicaid and those that prohibit the provision of certain services by an entity that has a financial relationship with the referring physician.

False and Other Improper Claims. Under the federal False Claims Act, the government may fine us if we knowingly submit, or participate in submitting, any claims for payment that are false or fraudulent, or that contain false or misleading information, or if we knowingly conceal or knowingly and improperly avoid or decrease an obligation to pay or transmit money or property to the government. An "obligation" includes an established duty arising from an express or implied contractual arrangement, from statute or regulation, or from the retention of an overpayment. Knowingly making or using a false record or statement to receive payment from the federal government or to improperly retain payment is also a violation. The False Claims Act does not require proof of specific intent to defraud: a provider can be found liable for submitting false claims with actual knowledge or with reckless disregard or deliberate ignorance of such falseness.

A False Claims lawsuit may be brought by the government or by a private individual by means of a "qui tam" action. A whistleblower shares in the proceeds of the case, typically being awarded between 15 and 25 percent of the proceeds. Such lawsuits have increased significantly in recent years. In addition, the federal government has engaged a number of nongovernmental-audit organizations to assist it in tracking and recovering false claims for healthcare services.

If we were ever found to have violated the False Claims Act, we would likely be required to make significant payments to the government (including treble damages and per claim penalties in addition to the reimbursements previously collected) and could be excluded from participating in Medicare, Medicaid and other government healthcare programs. Many states have similar false claims statutes. Healthcare fraud is a priority of the United States Department of Justice, the OIG and the Federal Bureau of Investigation which continue to devote a significant amount of resources to investigating healthcare fraud. State Medicaid agencies also have similar fraud and abuse authority, and many states have enacted laws similar to the federal False Claims Act.

While the criminal statutes generally are reserved for instances evidencing fraudulent intent, the civil and administrative penalty statutes are applied to an increasingly broad range of circumstances. Examples of activities giving rise to false claims liability include, without limitation, billing for services not rendered, misrepresenting services rendered (i.e., miscoding) and application for duplicate reimbursement. Additionally, the federal government has taken the position that claiming reimbursement for unnecessary or substandard services violates these statutes if the claimant should have known that the services were unnecessary or substandard. An entity may also be subjected to False Claims Act liability for violations of the federal anti-kickback statute and the Stark Law.

Criminal penalties also are available in the case of claims filed with private insurers if the federal government shows that the claims constitute mail fraud or wire fraud or violate a number of federal criminal healthcare fraud statutes.

We believe our billing and documentation practices comply with applicable laws and regulations in all material respects. We submit thousands of reimbursement claims to Medicare and Medicaid each year, however, and therefore can provide no assurance that our submissions are free from errors. Although we monitor our billing practices for compliance with applicable laws, such laws are very complex and the regulations and guidance interpreting such laws are subject to frequent changes and differing interpretations.

HIPAA Criminal Penalties. HIPAA imposes criminal penalties for fraud against any healthcare benefit program for theft or embezzlement involving healthcare and for false statements in connection with the payment of any health benefits. HIPAA also provides for broad prosecutorial subpoena authority and authorizes property forfeiture upon conviction of a federal healthcare offense. Significantly, the HIPAA provisions apply not only to federal programs, but also to private health benefit programs. HIPAA also broadened the authority of the OIG to exclude participants from federal healthcare programs. If the government were to seek any substantial penalties against us pursuant to these provisions, such an action could have a material adverse effect on us.

HIPAA Civil Penalties. HIPAA broadened the scope of certain fraud and abuse laws by adding several civil statutes that apply to all healthcare services, whether or not they are reimbursed under a federal healthcare program. HIPAA established civil monetary penalties for certain conduct, including upcoding and billing for medically unnecessary goods or services.

HIPAA Administrative Simplifications. The federal regulations issued under HIPAA contain provisions that:

- protect individual privacy by limiting the uses and disclosures of individually identifiable health information;
- require notifications to individuals, and in certain cases to government agencies and the media, in the event of a breach of unsecured protected health information;
- require the implementation of administrative, physical and technological safeguards to ensure the confidentiality, integrity and availability of individually identifiable health information in electronic form; and

- prescribe specific transaction formats and data code sets for certain electronic healthcare transactions.

If we fail to comply with HIPAA, we may be subject to civil monetary penalties up to $50,000 per violation, not to exceed $1.5 million per calendar year and, in certain circumstances, criminal penalties with fines up to $250,000 per violation and/or imprisonment. State attorneys general can bring a civil action to enjoin a HIPAA violation or to obtain statutory damages up to $25,000 per violation on behalf of residents of his or her state.

The DHHS has discretion in setting the amount of a civil monetary penalty, and may waive it entirely for violations due to reasonable cause and not willful neglect if the payment would be excessive relative to the violation. The regulations also provide for an affirmative defense if a covered entity can show that the violation was not due to willful neglect and was corrected within 30 days or an additional period deemed appropriate by the DHHS. Reasonable cause means circumstances that would make it unreasonable for the covered entity, despite the exercise of ordinary business care and prudence, to comply. Willful neglect is defined as conscious, intentional failure or reckless indifference to the obligation to comply. The factors to be considered in determining the amount of the penalty include the nature and circumstances of the violation, the degree of culpability, the history of other violations, and the extent of the resulting harm.

The HIPAA regulations related to privacy establish comprehensive federal standards relating to the use and disclosure of protected health information. The privacy regulations establish limits on the use and disclosure of protected health information, provide for patients' rights, including rights to access, request amendment of, and receive an accounting of certain disclosures of protected health information, and require certain safeguards to protect protected health information. In general, the privacy regulations do not supersede state laws that are more stringent or grant greater privacy rights to individuals. We believe our operations are in material compliance with the privacy regulations, but there can be no assurance that the federal government would agree.

Effective September 23, 2009, HIPAA requires that individuals be notified without unreasonable delay and within 60 days of their protected health information having been inappropriately accessed, acquired or disclosed. Depending on the number of individuals affected by such a breach, notification may be required to the media and federal government as well. The regulations prescribe the method and form of the required notices. Civil penalties up to $50,000 per violation with a maximum of $1.5 million per year may attach to failures to notify.

The HIPAA security regulations establish detailed requirements for safeguarding protected health information that is electronically transmitted or electronically stored. Some of the security regulations are technical in nature, while others may be addressed through policies and procedures. We believe our operations are in material compliance with the security regulations, but there can be no assurance that the federal government would agree.

The HIPAA transaction standards regulations are intended to simplify the electronic claims process and other healthcare transactions by encouraging electronic transmission rather than paper submission. These regulations provide for uniform standards for data reporting, formatting and coding that we must use in certain transactions with health plans. We believe our operations comply with these standards, but there can be no assurance that the federal government would agree.

Although we believe that we are in material compliance with these HIPAA regulations with which compliance is currently required, we cannot guarantee that the federal government would agree. Furthermore, additional changes to the HIPAA regulations are expected to be forthcoming in the next few years, which will require additional efforts to ensure compliance.

Anti-Kickback Law. Federal law commonly known as the "Anti-kickback Statute" prohibits the knowing and willful offer, solicitation, payment or receipt of anything of value (direct or indirect, overt or covert, in cash or in kind) which is intended to induce:

- the referral of an individual for a service for which payment may be made by Medicare and Medicaid or certain other federal healthcare programs; or
- the ordering, purchasing, leasing, or arranging for, or recommending the purchase, lease or order of, any service or item for which payment may be made by Medicare, Medicaid or certain other federal healthcare programs.

The Anti-kickback Statute has been broadly interpreted by a number of courts to prohibit remuneration which is offered or paid for otherwise legitimate purposes if the circumstances show that one purpose of the arrangement is to induce referrals. Even bona fide investment interests in a healthcare provider may be questioned under the Anti-kickback Statute if the government concludes that the opportunity to invest was offered as an inducement for referrals. The penalties for violations of this law include criminal sanctions including fines and/or imprisonment and exclusion from federal healthcare programs.

Our compensation and other financial arrangements, including leases, with physicians implicate the Anti-kickback Statute. The federal government has published regulations that provide "safe-harbors" that protect certain arrangements under the Anti-kickback Statute so long as certain requirements are met. We believe that our employment and leasing arrangements comply with applicable safe harbors. Failure to meet the requirements of a safe harbor, however, does not necessarily mean a transaction violates the Anti-kickback Statute. There are several aspects of our relationships with physicians to which the Anti-kickback Statute may be relevant. We claim reimbursement from Medicare or Medicaid for services that are ordered, in some cases, by our radiation oncologists who hold shares, or options to purchase shares, of our common stock. Although neither the existing nor potential investments in us by physicians qualify for protection under the safe harbor regulations, we do not believe that these activities fall within the type of activities the Anti-kickback Statute was intended to prohibit. We also claim reimbursement from Medicare and Medicaid for services referred from other healthcare providers with whom we have financial arrangements, including compensation for employment and professional services. While we believe that these arrangements generally fall within applicable safe harbors or otherwise do not violate the law, there can be no assurance that the government will agree, in which event we could be harmed.

We believe our operations are in material compliance with applicable Medicare and Medicaid and fraud and abuse laws and seek to structure arrangements to comply with applicable safe harbors where reasonably possible. There is a risk however, that the federal government might investigate such arrangements and conclude they violate the Anti-kickback Statute. Violations of the Anti-kickback Statute also subjects an entity to liability under the False Claims Act, including via "qui tam" action. If our arrangements were found to be illegal, we, the physician groups and/or the individual physicians would be subject to civil and criminal penalties, including exclusion from the participation in government reimbursement programs, and our arrangements would not be legally enforceable, which could materially adversely affect us.

Additionally, the OIG issues advisory opinions that provide advice on whether proposed business arrangements violate the anti-kickback law. In Advisory Opinion 98-4, the OIG addressed physician practice management arrangements. In Advisory Opinion 98-4, the OIG found that administrative services fees based on a percentage of practice revenue may violate the Anti-kickback Statute under certain circumstances. While we believe that the fees we charge for our services under the administrative services agreements are commensurate with the fair market value of the services and our arrangements are in material compliance with applicable law and regulations, we cannot guarantee that the OIG would agree. Any such adverse finding could have a material adverse impact on us.

Federal Self-Referral Law (The Stark Law). We are also subject to federal and state statutes banning payments and assigning penalties for referrals by physicians to healthcare providers with whom the physicians (or close family members) have a financial relationship. The Stark Law prohibits a physician from referring a patient to a healthcare provider for certain designated health services reimbursable by Medicare if the physician (or close family members) has a financial relationship with that provider, including an investment interest, a loan or debt relationship or a compensation relationship. The designated health services covered by the law include radiology services, infusion therapy, radiation therapy and supplies, clinical laboratory, diagnostic imaging, outpatient prescription drugs and hospital services, among others. In addition to the conduct directly prohibited by the law, the statute also prohibits "circumvention schemes" that are designed to obtain referrals indirectly that cannot be made directly. The regulatory framework of the Stark Law is to first prohibit all referrals from physicians to entities for Medicare DHS and then to except certain types of arrangements from that broad general prohibition.

Violation of these laws and regulations may result in prohibition of payment for services rendered, a refund of any Medicare or Medicaid payments for services that resulted from an unlawful referral, $15,000 civil monetary penalties for specified infractions, $100,000 for a circumvention scheme, criminal penalties, exclusion from Medicare and Medicaid programs, and potential false claims liability, including via "qui tam" action, of not less than $5,500 and not more than $11,000, plus three times the amount of damages that the government sustains because of an improperly submitted claim. The repayment provisions in Stark are not dependent on the parties having an improper intent; rather, Stark is a strict liability statute and any violation is subject to repayment of all "tainted" referrals.

Our compensation and other financial arrangements, including leases, with physicians implicate the Stark Law. The Stark Law, however, contains exceptions applicable to our operations. We rely on exceptions covering employees, leases, and in-office ancillary services, as well as the "group practice" definition that allows for certain compensation and profit sharing methodologies. Additionally, the definition of "referral" under the Stark Law excludes referrals of radiation oncologists for radiation therapy if (1) the request is part of a consultation initiated by another physician; and (2) the tests or services are furnished by or under the supervision of the radiation oncologist. We believe the services rendered by our radiation oncologists will comply with this exception to the definition of referral.

Some physicians who are not radiation oncologists are employed by companies owned by us or by professional corporations owned by certain of our directors, executive officers and equityholders with which we have administrative services agreements. To the extent these professional corporations employ such physicians, and they are deemed to have made referrals for radiation therapy, their referrals will be permissible under the Stark Law if they meet the employment exception, which requires, among other things, that the compensation be consistent with the fair market value of the services provided and that it not take into account (directly or indirectly) the volume or value of any referrals by the referring physician. Another Stark exception applicable to our financial relationships with physicians who are not radiation oncologists is the in-office ancillary services exception and accompanying group practice definition which permits profit distributions to physicians within a qualifying group practice structure. The Stark Law imposes detailed requirements in order to qualify for the in-office ancillary services exception, all of which are highly technical and many of which have to date not been subject to any judicial review or other agency interpretation.

In addition, the Health Care Reform Act requires referring physicians under Stark to inform patients that they may obtain certain imaging services (e.g. magnetic resonance imaging ("MRI"), computed tomography ("CT") and positron emission tomography ("PET")) or other designated health services as specified by the Secretary of the DHHS from a provider other than that physician, his or her group practice, or another physician in his or her group practice. The referring physician must provide each patient with a written list of at least five other suppliers who furnish such services within 25 miles of the referring physician's office.

We believe that our current operations comply in all material respects with the Stark Law, due to, among other things, various exceptions therein and implementing regulations that exempt either the referral or the financial relationship involved. Nevertheless, to the extent physicians affiliated with us make referrals to us and a financial relationship exists between the referring physicians and us, the government might take the position that the arrangement does not comply with the Stark Law. Any such finding could have a material adverse impact on us.

State Law

State Anti-Kickback Laws. Many states in which we operate have laws that prohibit the payment of kickbacks in return for the referral of patients. Some of these laws apply only to services reimbursable under the state Medicaid program. However, a number of these laws apply to all healthcare services in the state, regardless of the source of payment for the service. Although we believe that these laws prohibit payments to referral sources only where a principal purpose for the payment is for the referral, the laws in most states regarding kickbacks have been subjected to limited judicial and regulatory interpretation and, therefore, no assurances can be given that our activities will be found to be in compliance. Noncompliance with such laws could have a material adverse effect upon us and subject us and the physicians involved to penalties and sanctions.

State Self-Referral Laws. A number of states in which we operate, such as Florida, have enacted self-referral laws that are similar in purpose to the Stark Law. However, each state law is unique. The state laws and regulations vary significantly from state to state, are often vague and, in many cases, have not been widely interpreted by courts or regulatory agencies. State statutes and regulations affecting the referral of patients to healthcare providers range from statutes and regulations that are substantially the same as the federal laws and safe harbor regulations to a simple requirement that physicians or other healthcare professionals disclose to patients any financial relationship the physicians or healthcare professionals have with a healthcare provider that is being recommended to the patients. Some states only prohibit referrals where the physician's financial relationship with a healthcare provider is based upon an investment interest. Other state laws apply only to a limited number of designated health services.

These statutes and regulations generally apply to services reimbursed by both governmental and private payers. Violations of these laws may result in prohibition of payment for services rendered, refund of any monies received pursuant to a prohibited referral, loss of licenses as well as fines and criminal penalties.

We believe that we are in compliance with the self-referral law of each state in which we have a financial relationship with a physician. However, we cannot guarantee that the government would agree, and adverse judicial or administrative interpretations of any of these laws could have a material adverse effect on our operating results and financial condition. In addition, expansion of our operations into new jurisdictions, or new interpretations of laws in existing jurisdictions, could require structural and organizational modifications of our relationships with physicians to comply with that jurisdiction's laws. Such structural and organizational modifications could have a material adverse effect on our operating results and financial condition.

Fee-Splitting Laws. Many states in which we operate prohibit the splitting or sharing of fees between physicians and referral sources and/or between physicians and non-physicians. These laws vary from state to state and are enforced by courts and regulatory agencies, each with broad discretion. Some states have interpreted management agreements between entities and physicians as unlawful fee-splitting. In most cases, it is not considered to be fee-splitting when the payment made by the physician is reasonable, fair market value reimbursement for services rendered on the physician's behalf.

In certain states, we receive fees from professional corporations owned by certain of our directors, executive officers and equityholders under administrative services agreements. We believe we structure these fee provisions to comply with applicable state laws relating to fee-splitting. However, there can be no certainty that, if challenged, either we or the professional corporations will be found to be in compliance with each state's fee-splitting laws, and, a successful challenge could have a material adverse effect upon us.

In certain states we operate integrated cancer care practices and share ancillary profits within the practice. We believe we have structured these financial arrangements to comply with state fee-splitting laws. However, there can be no certainty that, if challenged, we will be found to be in compliance with each state's fee-splitting provisions and a successful challenge could have a material adverse effect on us.

We believe our arrangements with physicians comply in all material respects with the fee-splitting laws of the states in which we operate. Nevertheless, it is possible regulatory authorities or other parties could claim we are engaged in fee-splitting. If such a claim were successfully asserted in any jurisdiction, our radiation oncologists and other physicians could be subject to civil and criminal penalties, professional discipline and we could be required to restructure or terminate our contractual and other arrangements. Any restructuring of our contractual and other arrangements with physician practices could result in lower revenue from such practices, increased expenses in the operation of such practices and reduced input into the business decisions of such practices. Termination of such contracts would result in loss of revenue. In addition, expansion of our operations to other states with fee-splitting prohibitions may require structural and organizational modification to the form of relationships that we currently have with physicians, affiliated practices and hospitals. Any modifications could result in less profitable relationships with physicians, affiliated practices and hospitals, less influence over the business decisions of physicians and affiliated practices and failure to achieve our growth objectives.

Corporate Practice of Medicine. We are not licensed to practice medicine. The practice of medicine is conducted solely by our licensed radiation oncologists and other licensed physicians. The manner in which licensed physicians can be organized to perform and bill for medical services is governed by the laws of the state in which medical services are provided and by the medical boards or other entities authorized by such states to oversee the practice of medicine. Most states prohibit any person or entity other than a licensed professional from holding him, her or itself out as a provider of diagnoses, treatment or care of patients. Many states extend this prohibition to bar companies not wholly-owned by licensed physicians from employing physicians, a practice commonly referred to as the "Corporate Practice of Medicine", in order to maintain physician independence and clinical judgment.

Business corporations are generally not permitted under certain state laws to exercise control over the medical judgments or decisions of physicians, or engage in certain practices such as fee-splitting with physicians. In states where we are not permitted to own a medical practice, we perform only non-medical and administrative and support services, do not represent to the public or clients that we offer professional medical services and do not exercise influence or control over the practice of medicine.

Corporate Practice of Medicine laws vary widely by state regarding the extent to which a licensed physician can affiliate with corporate entities for the delivery of medical services. In Florida, it is not uncommon for business corporations to own medical practices. New York, by contrast, prohibits physicians from sharing revenue received in connection with the furnishing of medical care, other than with a partner, employee or associate in a professional corporation, subcontractor or physician consultant relationship. We have developed arrangements which we believe are in compliance with the Corporate Practice of Medicine laws in the states in which we operate.

We believe our operations and contractual arrangements as currently conducted are in material compliance with existing applicable laws. However, we cannot assure you that we will be successful if our existing organization and our contractual arrangements with the professional corporations are challenged as constituting the unlicensed practice of medicine. In addition, we might not be able to enforce certain of our arrangements, including non-competition agreements and transition and stock pledge agreements. While the precise penalties for violation of state laws relating to the corporate practice of medicine vary from state to state, violations could lead to fines, injunctive relief dissolving a corporate offender or criminal felony charges. There can be no assurance that review of our business and the professional corporations by courts or regulatory authorities will not result in a determination that could adversely affect their operations or that the healthcare regulatory environment will not change so as to restrict existing operations or their expansion. In the event of action by any regulatory authority limiting or prohibiting us or any affiliate from carrying on our business or from expanding our operations and our affiliates to certain jurisdictions, we may be required to implement structural and organizational modifications, which could adversely affect our ability to conduct our business.

Antitrust Laws. In connection with the Corporate Practice of Medicine laws referred to above, certain of the physician practices with which we are affiliated are necessarily organized as separate legal entities. As such, the physician practice entities may be deemed to be persons separate both from us and from each other under the antitrust laws and, accordingly, subject to a wide range of laws that prohibit anticompetitive conduct among separate legal entities. These laws may limit our ability to enter into agreements with separate practices that compete with one another. In addition, where we also are seeking to acquire or affiliate with established and reputable practices in our target geographic markets, any market concentration could lead to antitrust claims.

We believe we are in material compliance with federal and state antitrust laws and intend to comply with any state and federal laws that may affect the development of our business. There can be no assurance, however, that a review of our business by courts or regulatory authorities would not adversely affect our operations and the operations of our affiliated physician practice entities.

State Licensing. As a provider of radiation therapy services in the states in which we operate, we must maintain current occupational and use licenses for our treatment centers as healthcare facilities and machine registrations for our linear accelerators and simulators. Additionally, we must maintain radioactive material licenses for each of our treatment centers which utilize radioactive sources. We believe that we possess or have applied for all requisite state and local licenses and are in material compliance with all state and local licensing requirements.

Certificate of Need. Many states have enacted certificate of need laws, including but not limited to Kentucky, Massachusetts, Michigan, North Carolina Rhode Island, South Carolina and West Virginia, which require prior approval for a number of actions, including for the purchase, construction, acquisition, renovation or expansion of healthcare facilities and treatment centers, to make certain capital expenditures or to make changes in services or bed capacity. In deciding whether to approve certain requests, these states consider the need for additional or expanded healthcare facilities or services. The certificate of need program is intended to prevent unnecessary duplication of services and can be a competitive process whereby only one proposal among competing applicants who wish to provide a particular health service is chosen or a proposal by one applicant is challenged by another provider who may prevail in getting the state to deny the addition of the service.

In certain states these certificate of need statutes and regulations apply to our related physician corporations and in others it applies to hospitals where we have management agreements or joint venture relationships.

We believe that we have applied for all requisite state certificate of need approvals or notified state authorities as required by statute and are in material compliance with state requirements. There

can be no assurance, however, that a review of our business or proposed new practices by regulatory authorities would not limit our growth or otherwise adversely affect the operations of us and our affiliated physician practice entities.

Other Laws and Regulations

Hazardous Materials. We are subject to various federal, state and local laws and regulations governing the use, discharge and disposal of hazardous materials, including medical waste products. We believe that all of our treatment centers comply with these laws and regulations in all material respects and we do not anticipate that any of these laws will have a material adverse effect on our operations.

Although our linear accelerators and certain other equipment do not use radioactive or other hazardous materials, our treatment centers do provide specialized treatment involving the implantation of radioactive material in the prostate and other organs. The radioactive sources generally are obtained from, and returned to, the suppliers, which have the ultimate responsibility for their proper disposal. We, however, remain subject to state and federal laws regulating the protection of employees who may be exposed to hazardous material and the proper handling, storage and disposal of that material.

Reimbursement and Cost Containment

Reimbursement

We provide a full range of both professional and technical services. Those services include the initial consultation, clinical treatment planning, simulation, medical radiation physics, dosimetry, treatment devices, special services and clinical treatment management procedures.

The initial consultation is charged as a professional fee for evaluation of the patient prior to the decision to treat the patient with radiation therapy. The clinical treatment planning also is reimbursed as a technical and professional component. Simulation of the patient prior to treatment involves both a technical and a professional component, as the treatment plan is verified with the use of a simulator accompanied by the physician's approval of the plan. The medical radiation physics, dosimetry, treatment devices and special services also include both professional and technical components. The basic dosimetry calculation is accomplished, treatment devices are specified and approved, and the physicist consults with the radiation oncologist, all as professional and technical components of the charge. Special blocks, wedges, shields, or casts are fabricated, all as a technical and professional component.

The delivery of the radiation treatment from the linear accelerator is a technical charge. The clinical treatment administrative services fee is the professional fee charged weekly for the physician's management of the patient's treatment. Global fees containing both professional and technical components also are charged for specialized treatment such as hyperthermia, clinical intracavitary hyperthermia, clinical brachytherapy, interstitial radioelement applications, and remote after-loading of radioactive sources.

Coding and billing for radiation therapy is complex. We maintain a staff of certified coding professionals responsible for interpreting the services documented on the patients' charts to determine the appropriate coding of services for billing of third-party payers. This staff provides coding and billing services for all of our treatment centers except for four treatment centers in New York. In addition, we do not provide coding and billing services to hospitals where we are providing only the professional component of radiation treatment services. We provide training for our coding staff and believe that our coding and billing expertise result in appropriate and timely reimbursement. Given the complexity of the regulations and guidance governing coding and billing, we cannot guarantee that the government will not challenge any of our practices. Any such challenge could have a material adverse effect on us.

Cost Containment

We derived approximately 44% , 48% and 48% of our net patient service revenue for the years ended December 31, 2009, 2010 and 2011, respectively, from payments made by government sponsored healthcare programs, principally Medicare. These programs are subject to substantial regulation by the federal and state governments. Any change in payment regulations, policies, practices, interpretations or statutes that place limitations on reimbursement amounts, or changes in reimbursement coding, or practices could materially and adversely affect our financial condition and results of operations.

In recent years, the federal government has sought to constrain the growth of spending in the Medicare and Medicaid programs. Through the Medicare program, the federal government has implemented a resource-based relative value scale ("RBRVS") payment methodology for physician services. RBRVS is a fee schedule that, except for certain geographical and other adjustments, pays similarly situated physicians the same amount for the same services. The RBRVS is adjusted each year and is subject to increases or decreases at the discretion of Congress. Changes in the RBRVS may result in reductions in payment rates for procedures provided by the Company. RBRVS-type payment systems also have been adopted by certain private third-party payers and may become a predominant payment methodology. Broader implementation of such programs could reduce payments by private third-party payers and could indirectly reduce our operating margins to the extent that the cost of providing management services related to such procedures could not be proportionately reduced. To the extent our costs increase, we may not be able to recover such cost increases from government reimbursement programs. In addition, because of cost containment measures and market changes in non-governmental insurance plans, we may not be able to shift cost increases to non-governmental payers. Changes in the RBRVS could result in a reduction from historical levels in per patient Medicare revenue received by us; however, we do not believe such reductions would, if implemented, result in a material adverse effect on us.

In addition to current governmental regulation, both federal and state governments periodically propose legislation for comprehensive reforms affecting the payment for and availability of healthcare services. Aspects of certain of such healthcare proposals, such as reductions in Medicare and Medicaid payments, if adopted, could adversely affect us. Other aspects of such proposals, such as universal health insurance coverage and coverage of certain previously uncovered services, could have a positive impact on our business. On March 21, 2010, the House of Representatives passed the Patient Protection and Affordable Care Act, and the corresponding reconciliation bill. President Obama signed the larger comprehensive bill into law on March 23, 2010 and the reconciliation bill on March 30, 2010. The comprehensive $940 billion dollar overhaul is expected to extend coverage to approximately 32 million previously uninsured Americans. We anticipate that the Health Care Reform Act will significantly affect how the healthcare industry operates in relation to Medicare, Medicaid and the insurance industry. The Health Care Reform Act contains a number of provisions, including those governing fraud and abuse, enrollment in federal health care programs, and reimbursement changes, which will impact existing government health care programs and will result in the development of new programs, including Medicare payment for performance initiatives and improvements to the physician quality reporting system and feedback program. It is not possible at this time to predict what, if any, additional reforms will be adopted by Congress or state legislatures, or when such reforms would be adopted and implemented. As healthcare reform progresses and the regulatory environment accommodates reform, it is likely that changes in state and federal regulations will necessitate modifications to our agreements and operations. While we believe we will be able to restructure in accordance with applicable laws and regulations, we cannot assure that such restructuring in all cases will be possible or profitable.

Although governmental payment reductions have not materially affected us in the past, it is possible that such changes implemented in connection with the Health Care Reform Act and any future changes could have a material adverse effect on our financial condition and results of operations. In

addition, Medicare, Medicaid and other government sponsored healthcare programs are increasingly shifting to some form of managed care. Additionally, funds received under all healthcare reimbursement programs are subject to audit with respect to the proper billing for physician services. Retroactive adjustments of revenue from these programs could occur. We expect that there will continue to be proposals to reduce or limit Medicare and Medicaid payment for services.

Rates paid by private third-party payers, including those that provide Medicare supplemental insurance, are based on established physician, clinic and hospital charges and are generally higher than Medicare payment rates. Changes in the mix of our patients between non-governmental payers and government sponsored healthcare programs, and among different types of non-government payer sources, could have a material adverse effect on us.

Reevaluations and Examination of Billing

Payers periodically reevaluate the services they cover. In some cases, government payers such as Medicare and Medicaid also may seek to recoup payments previously made for services determined not to be covered. Any such action by payers would have an adverse affect on our revenue and earnings.

Due to the uncertain nature of coding for radiation therapy services, we could be required to change coding practices or repay amounts paid for incorrect practices either of which could have a materially adverse effect on our operating results and financial condition.

Other Regulations

In addition, we are subject to licensing and regulation under federal, state and local laws relating to the collecting, storing, handling and disposal of infectious and hazardous waste and radioactive materials as well as the safety and health of laboratory employees. We believe our operations are in material compliance with applicable federal and state laws and regulations relating to the collection, storage, handling, treatment and disposal of all infectious and hazardous waste and radioactive materials. Nevertheless, there can be no assurance that our current or past operations would be deemed to be in compliance with applicable laws and regulations, and any noncompliance could result in a material adverse effect on us. We utilize licensed vendors for the disposal of such specimen and waste.

In addition to our comprehensive regulation of safety in the workplace, the federal Occupational Safety and Health Administration has established extensive requirements relating to workplace safety for healthcare employees, whose workers may be exposed to blood-borne pathogens, such as HIV and the hepatitis B virus. These regulations require work practice controls, protective clothing and equipment, training, medical follow-up, vaccinations and other measures designed to minimize exposure to, and transmission of, blood-borne pathogens.

Available Information

As a result of the Existing Notes exchange offer, we became subject to the informational requirements of the Securities Exchange Act of 1934, as amended, (the "Exchange Act") and, in accordance therewith, file reports and other information with the Securities and Exchange Commission (the "SEC"). Such reports and other information can be inspected and copied at the Public Reference Room of the SEC located at Room 1580, 100 F Street, N.E., Washington D.C. 20549. Copies of such materials can be obtained from the Public Reference Room of the SEC at prescribed rates. You can call the SEC at 1-800-SEC-0330 to obtain information on the operation of the Public Reference Room. Such materials may also be accessed electronically by means of the SEC's home page on the Internet (http://www.sec.gov).

Our corporate website is *www.rtsx.com* and we make available copies of our filings under the Exchange Act, including Annual Reports on Form 10-K,, Quarterly Reports on Form 10-Q , Current Reports on Form 8-K and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act on our website, free of charge, under the heading "SEC Filings", as soon as reasonably practicable after such material is filed or furnished to the SEC. The information contained on the website is not part of this Annual Report on Form 10-K and is not incorporated into this Annual Report on Form 10-K by reference.

Item 1A. *Risk Factors*

You should carefully consider the risk factors set forth below as well as the other information contained in this Annual Report on Form 10-K, including our consolidated financial statements and the related notes, in evaluating our company and our business. The risks described below are not the only risks facing us. Additional risks and uncertainties not currently known to us or those we currently view to be immaterial may also materially and adversely affect our business, financial condition or results of operations. Any of the following risks could materially and adversely affect our business, financial condition or results of operations. In such a case, you may lose all or part of your original investment.

Risks Related to Our Business

We depend on payments from government Medicare and, to a lesser extent, Medicaid programs for a significant amount of our revenue. Our business could be materially harmed by any changes that result in reimbursement reductions.

Our payer mix is concentrated with Medicare patients due to the high proportion of cancer patients over the age of 65. We estimate that approximately 44%, 48% and 48% of our net patient service revenue for the years ended December 31 2009, 2010 and 2011, respectively, consisted of payments from Medicare and Medicaid. Only a small percentage of that revenue resulted from Medicaid payment. These government programs generally reimburse us on a fee-for-service basis based on predetermined government reimbursement rate schedules. As a result of these reimbursement schedules, we are limited in the amount we can record as revenue for our services from these government programs. The Centers for Medicare & Medicaid Services ("CMS") can change these schedules and therefore the prices that the agency pays for these services. In addition, if our operating costs increase, we will not be able to recover these costs from government payers. As a result, our financial condition and results of operations may be adversely affected by changes in reimbursement for Medicare reimbursement. Various state Medicaid programs also have recently reduced Medicaid payments to providers based on state budget reductions. Although Medicaid reimbursement encompasses only a small portion of our business, there can be no certainty as to whether Medicaid reimbursement will increase or decrease in the future and what affect, if any, this will have on our business.

In July 2009, in response to a study of diagnostic imaging by the Medicare Payment Advisory Commission, CMS initially proposed that 2010 Medicare reimbursement rates for radiation oncology be significantly reduced, primarily caused by increasing the assumed equipment utilization factors from 50% to 90% for equipment with a cost of $1 million or greater which includes both diagnostic imaging and radiation oncology. The final 2010 Medicare rates promulgated by CMS applied such increased equipment utilization factor only to diagnostic imaging, and therefore, did not impact radiation oncology. CMS in its 2011 Medicare Physician Fee Schedule posted November 2, 2010, similarly does not revise the equipment utilization factor for radiation oncology. There can be no assurance, however, that CMS will not revisit radiation oncology's equipment utilization assumption at some time in the future or that any resulting adjustment to the rates paid to radiation oncology services will not be material.

Medicare reimbursement rates for all procedures under Medicare are determined by a formula which takes into account a conversion factor ("CF") which is updated on an annual basis based on the sustainable growth rate ("SGR"). On January 1, 2010, the CF was scheduled to decrease 21.2%, but Congress postponed this decrease throughout the year by passing several pieces of legislation. Additionally, in June 2010, Congress passed a 2.2% increase. The CF was again scheduled to decrease 24.9% as of January 1, 2011, but Congress delayed the scheduled cut until the end of 2011. The final Medicare 2012 Physician Fee Schedule, released by CMS on November 1, 2011, would have resulted in a reimbursement decrease of 27.4% as of January 1, 2012. However, Congress again delayed the

implementation of this payment cut, first through February 29, 2012 under the Temporary Payroll Tax Cut Continuation Act of 2011, and then through the end of 2012 under the Middle Class Tax Relief and Job Creation Act of 2012. If future reductions are not suspended, and if a permanent "doc fix" is not signed into law, the reimbursement decrease currently scheduled to take effect on January 1, 2013, will have a significant adverse impact on our business.

Reforms to the United States healthcare system may adversely affect our business.

National healthcare reform remains a focus at the federal level. On March 21, 2010, the House of Representatives passed the Patient Protection and Affordable Care Act, and the corresponding reconciliation bill. President Obama signed the larger comprehensive bill into law on March 23, 2010 and the reconciliation bill on March 30, 2010 (collectively, the "Health Care Reform Act"). The comprehensive $940 billion dollar overhaul is expected to extend coverage to approximately 32 million previously uninsured Americans.

A significant portion of our patient volume is derived from government healthcare programs, principally Medicare, which are highly regulated and subject to frequent and substantial changes. We anticipate the Health Care Reform Act will significantly affect how the healthcare industry operates in relation to Medicare, Medicaid and the insurance industry. The Health Care Reform Act contains a number of provisions, including those governing fraud and abuse, enrollment in federal healthcare programs, and reimbursement changes, which will impact existing government healthcare programs and will result in the development of new programs, including Medicare payment for performance initiatives and improvements to the physician quality reporting system and feedback program. We can give no assurance that the Health Care Reform Act will not adversely affect our business and financial results, and we cannot predict how future federal or state legislative or administrative changes relating to healthcare reform would affect our business.

If payments by managed care organizations and other commercial payers decrease, our revenue and profitability could be adversely affected.

We estimate that approximately 55%, 51% and 51% of our net patient service revenue for the years ended December 31 2009, 2010 and 2011 respectively, was derived from commercial payers such as managed care organizations and private health insurance programs as well as individuals. As of December 31, 2011, we have over 1,300 contracts with commercial payers. These commercial payers generally pay us for the services rendered to an insured patient based upon predetermined rates. Managed care organizations typically pay at lower rates than private health insurance programs. While commercial payer rates are generally higher than government program reimbursement rates, commercial payer rates are based in part on Medicare reimbursement rates and when Medicare rates are lowered, commercial rates are often lowered as well. If managed care organizations and other private insurers reduce their rates or we experience a significant shift in our revenue mix toward certain additional managed care payers or Medicare or Medicaid reimbursements, then our revenue and profitability may decline and our operating margins will be reduced. Nongovernment payers, including managed care payers, continue to demand discounted fee structures, and the trend toward consolidation among nongovernment payers tends to increase their bargaining power over fee structures. Our future success will depend, in part, on our ability to retain and renew our managed care contracts as well as enter into new managed care contracts on terms favorable to us. Any inability to maintain suitable financial arrangements with commercial payers could have a material adverse impact on our business.

Our overall business results may suffer from the economic downturn.

The United States economy has weakened significantly. Depressed consumer spending and higher unemployment rates continue to pressure many industries and geographic locations. During economic

downturns, governmental entities often experience budget deficits as a result of increased costs and lower than expected tax collections. These budget deficits may force federal, state and local government entities to decrease spending for health and human service programs, including Medicare, Medicaid and similar programs, which represent significant payer sources for our treatment centers. Other risks we face from general economic weakness include potential declines in the population covered under managed care agreements, patient decisions to postpone or cancel elective procedures as well as routine diagnostic examinations, potential increases in the uninsured and underinsured populations and further difficulties in our collecting patient co-payment and deductible receivables.

Due to the rising costs of managed care premiums and co-pay amounts, coupled with the current economic environment, we may realize an increased exposure to bad debt due to patients' inability to pay for certain forms of cancer treatment.

As more patients become uninsured as a result of job losses or receive reduced coverage as a result of cost-control measures by employers to offset the increased costs of managed care premiums, patients are becoming increasingly responsible for the rising costs of treatment, which is increasing our exposure to bad debt. This also relates to patient accounts for which the primary insurance carrier has paid the amounts covered by the applicable agreement, but patient responsibility amounts (deductibles and co-payments) remain outstanding. The shifting responsibility to pay for care has, in some instances, resulted in patients electing not to receive certain forms of cancer treatment.

In response to this environment, we have improved our processes associated with verification of insurance eligibility and patient responsibility payment programs. In addition, we have improved our patient financial counseling efforts and developed tools to monitor our progress in this area. However, a continuation of the trends that have resulted in an increasing proportion of accounts receivable being comprised of uninsured accounts and a deterioration in the collectability of these accounts will adversely affect our cash flows and results of operations.

We depend on recruiting and retaining radiation oncologists and other qualified healthcare professionals for our success.

Our success is dependent upon our continuing ability to recruit, train and retain or affiliate with radiation oncologists, physicists, dosimetrists and radiation therapists. While there is currently a national shortage of these healthcare professionals, we have not experienced significant problems attracting and retaining key personnel and professionals in the recent past. We face competition for such personnel from other healthcare providers, research and academic institutions, government entities and other organizations. In the event we are unable to recruit and retain these professionals, such shortages could have a material adverse effect on our ability to grow. Additionally, many of our senior radiation oncologists, due to their reputations and experience, are very important in the recruitment and education of radiation oncologists. The loss of any such senior radiation oncologists could negatively impact us.

Most of our approximately 117 radiation oncologists in the domestic U.S. are employed under employment agreements which, among other things, provide that the radiation oncologists will not compete with us (or the professional corporations contracting with us) for a period of time after their employment terminates. Such covenants not to compete are enforced to varying degrees from state to state. In most states, a covenant not to compete will be enforced only to the extent that it is necessary to protect the legitimate business interest of the party seeking enforcement, that it does not unreasonably restrain the party against whom enforcement is sought and that it is not contrary to the public interest. This determination is made based upon all the facts and circumstances of the specific case at the time enforcement is sought. It is unclear whether our interests under our administrative services agreements will be viewed by courts as the type of protected business interest that would permit us or the professional corporations to enforce a non-competition covenant against the radiation

oncologists. Since our success depends in substantial part on our ability to preserve the business of our radiation oncologists, a determination that these provisions are unenforceable could have a material adverse effect on us.

We depend on our senior management and we may be materially harmed if we lose any member of our senior management.

We are dependent upon the services of our senior management, especially Daniel E. Dosoretz, M.D., our Chief Executive Officer, President and a director on the Company's board of directors, Daniel H. Galmarini, our Chief Technology Officer, Constantine A. Mantz, M.D., our Chief Medical Officer, Eduardo Fernandez, M.D. Ph.D., Senior Vice President, Physician Management and Alejandro Dosoretz, President and Chief Executive Officer of Medical Developers, LLC ("MDLLC"). We have entered into executive employment agreements with certain members of our senior management, including Dr. Dosoretz. Because these members of our senior management team have been with us for over 10 years and have contributed greatly to our growth, their services would be very difficult, time consuming and costly to replace. We carry key-man life insurance on Dr. Dosoretz. The loss of key management personnel or our inability to attract and retain qualified management personnel could have a material adverse effect on us. A decision by any of these individuals to leave our employ, to compete with us or to reduce their involvement, could have a material adverse effect on our business.

We may not be able to grow our business effectively or successfully implement our growth plans if we are unable to recruit additional management and other personnel.

Our ability to continue to grow our business effectively and successfully implement our growth strategy is highly dependent upon our ability to attract and retain qualified management employees and other key employees. We believe there are a limited number of qualified people in our business and the industry in which we compete. As such, there can be no assurance that we will be able to identify and retain the key personnel that may be necessary to grow our business effectively or successfully implement our growth strategy. If we are unable to attract and retain talented personnel it could limit our ability to grow our business.

Our substantial debt could adversely affect our financial condition.

We have $679.0 million of total debt outstanding. Subject to the limits contained in the indenture governing our notes and our senior secured credit facilities, we may be able to incur additional debt from time to time to finance working capital, capital expenditures, investments or acquisitions, or for other purposes. If we do so, the risks related to our high level of debt could intensify. Specifically, our high level of debt could have important consequences, including the following:

- making it more difficult for us to satisfy our obligations with respect to our debt;
- limiting our ability to obtain additional financing to fund future working capital, capital expenditures, acquisitions or other general corporate requirements;
- requiring a substantial portion of our cash flows to be dedicated to debt service payments instead of other purposes;
- increasing our vulnerability to general adverse economic and industry conditions;
- limiting our flexibility in planning for and reacting to changes in the industry in which we compete;
- placing us at a disadvantage compared to other, less leveraged competitors; and
- increasing our cost of borrowing.

Our ability to make scheduled payments on and to refinance our indebtedness depends on and is subject to our financial and operating performance, which in turn is affected by general and regional economic, financial, competitive, business and other factors beyond our control, including the availability of financing in the international banking and capital markets. We cannot assure you that our business will generate sufficient cash flow from operations or that future borrowings will be available to us in an amount sufficient to enable us to service our debt, to refinance our debt or to fund our other liquidity needs. If we are unable to meet our debt obligations or to fund our other liquidity needs, we will need to restructure or refinance all or a portion of our debt, which could cause us to default on our debt obligations and impair our liquidity. Any refinancing of our indebtedness could be at higher interest rates and may require us to comply with more onerous covenants which could further restrict our business operations.

The radiation therapy market is highly competitive.

Radiation therapy is a highly competitive business in each market in which we operate. Our treatment centers face competition from hospitals, other medical practitioners and other operators of radiation treatment centers. There is a growing trend of physicians in specialties other than radiation oncology, such as urology, entering the radiation treatment business. If this trend continues it could harm our referrals and our business. Certain of our competitors have longer operating histories and greater financial and other resources than us. In addition, in states that do not require a certificate of need for the purchase, construction or expansion of healthcare facilities or services, competition in the form of new services, facilities and capital spending is more prevalent. If our competitors are better able to attract patients, recruit physicians, expand services or obtain favorable managed care contracts at their facilities than our centers, we may experience an overall decline in patient volume. In the event that we are not able to compete successfully, our business may be adversely affected and competition may make it more difficult for us to affiliate with or employ additional radiation oncologists on terms that are favorable to us.

We could be the subject of governmental investigations, claims and litigation.

Healthcare companies are subject to numerous investigations by various governmental agencies. Further, under the False Claims Act, private parties have the right to bring "qui tam", or "whistleblower", suits against companies that knowingly submit false claims for payments to, or improperly retain overpayments from, the government. The False Claims Act imposes penalties of not less than $5,500 and not more than $11,000, plus three times the amount of damages which the government sustains because of the submission of a false claim. In addition, if we are found to have violated the False Claims Act, we could be excluded from participation in Medicare, Medicaid and other federal healthcare programs. Some states have adopted similar state whistleblower and false claims provisions. Certain of our individual facilities have received, and other facilities may receive, inquiries from federal and state agencies related to potential False Claims Act liability. Depending on whether the underlying conduct in these or future inquiries or investigations could be considered systemic, their resolution could have a material, adverse effect on our financial position, results of operations and liquidity.

Governmental agencies and their agents, such as the Medicare Administrative Contractors, fiscal intermediaries and carriers, as well as the OIG, CMS and state Medicaid programs, conduct audits of our healthcare operations. Private payers may conduct similar post-payment audits, and we also perform internal audits and monitoring. Depending on the nature of the conduct found in such audits and whether the underlying conduct could be considered systemic, the resolution of these audits could have a material adverse effect on our financial position, results of operations and liquidity.

The Medicare Prescription Drug, Improvement, and Modernization Act of 2003 ("MMA") established the Recovery Audit Contractor ("RAC") three-year demonstration program to conduct

post-payment reviews to detect and correct improper payments in the fee-for-service Medicare program. The Tax Relief and Health Care Act of 2006 made the RAC program permanent and mandated its nationwide expansion by 2010. CMS has awarded contracts to four RACs that are implementing the permanent RAC program on a nationwide basis. In addition, CMS employs Medicaid Integrity Contractors ("MICs") to perform post-payment audits of Medicaid claims and identify overpayments. Throughout 2011, MIC audits will continue to expand. In addition to MICs, several other contractors, including the state Medicaid agencies, have increased their review activities. Should we be found out of compliance with any of these laws, regulations or programs, depending on the nature of the findings, our business, our financial position and our results of operations could be negatively impacted.

We may be subject to actions for false claims, which could harm our business, if we do not comply with government coding and billing rules.

If we fail to comply with federal and state documentation, coding and billing rules, we could be subject to criminal and/or civil penalties, loss of licenses and exclusion from the Medicare and Medicaid programs, which could harm us. We estimate that approximately 44%, 48% and 48% of our net patient service revenue for the years ended December 31 2009, 2010 and 2011, respectively, consisted of payments from Medicare and Medicaid programs. In billing for our services to third-party payers, we must follow complex documentation, coding and billing rules. These rules are based on federal and state laws, rules and regulations, various government pronouncements, and on industry practice. Failure to follow these rules could result in potential civil liability under the False Claims Act, under which extensive financial penalties can be imposed. It could further result in criminal liability under various federal and state criminal statutes. We submit thousands of claims for Medicare and other payments and there can be no assurance that there have not been errors. While we carefully and regularly review our documentation, coding and billing practices as part of our compliance program, the rules are frequently vague and confusing and we cannot assure that governmental investigators, private insurers or private whistleblowers will not challenge our practices. Such a challenge could result in a material adverse effect on our business.

If we fail to comply with the federal anti-kickback statute, we could be subject to criminal and civil penalties, loss of licenses and exclusion from the Medicare and Medicaid programs, which could materially harm us.

A provision of the Social Security Act, commonly referred to as the federal anti-kickback statute, prohibits the offer, payment, solicitation or receipt of any form of remuneration in return for referring, ordering, leasing, purchasing or arranging for or recommending the ordering, purchasing or leasing of items or services payable by Medicare, Medicaid or any other federally funded healthcare program. The federal anti-kickback statute is very broad in scope, as remuneration includes the transfer of anything of value, in cash or in kind. Financial relationships covered by this statute can include any relationship where remuneration is provided for referrals including payments not commensurate with fair market value, whether in the form of space, equipment leases, professional or technical services or anything else of value. As it is an "intent-based" statute, as detailed in federal court precedent, one or both parties must intend the remuneration to be in exchange for or to induce referrals. Violations of the federal anti-kickback statute may result in substantial civil or criminal penalties, including criminal fines of up to $25,000, imprisonment of up to five years, civil penalties under the Civil Monetary Penalties Law of up to $50,000 for each violation, plus three times the remuneration involved, civil penalties under the federal False Claims Act of up to $11,000 for each claim submitted, plus three times the amounts paid for such claims and exclusion from participation in the Medicare and Medicaid programs. This participation exclusion, if applied to us or one or more of our subsidiaries or affiliates, could result in significant reductions in our revenues and could have a material adverse effect on our business.

In addition, most of the states in which we operate, including Florida, have also adopted laws, similar to the federal anti-kickback statute, that prohibit payments to physicians in exchange for referrals, some of which apply regardless of whether the source of payment is a government payer or a private payer. These statutes typically impose criminal and civil penalties as well as loss of licenses.

Under a provision of the federal Civil Monetary Penalties Law, civil monetary penalties (and exclusion) may be imposed on any person who offers or transfers remuneration to any patient who is a Medicare or Medicaid beneficiary, when the person knows or should know that the remuneration is likely to induce the patient to receive medical services from a particular provider. This broad provision applies to many kinds of inducements or benefits provided to patients, including complimentary items, services or transportation that are of more than a nominal value. We have reviewed our practices of providing services to our patients, and have structured those services in a manner that we believe complies with the law and its interpretation by government authorities. We cannot provide assurances, however, that government authorities will not take a contrary view and impose civil monetary penalties and exclude us for past or present practices.

If we fail to comply with physician self-referral laws as they are currently interpreted or may be interpreted in the future, or if other legislative restrictions are issued, we could incur a significant loss of reimbursement revenue.

We are subject to the federal Stark Law, as well as similar state statutes and regulations, which bans payments for designated health services ("DHS") rendered as a result of referrals by physicians to DHS entities with which the physicians (or immediate family members) have a financial relationship. DHS includes but is not limited to radiation therapy, radiology and laboratory services. A "financial relationship" includes investment and compensation arrangements, both direct and indirect. The regulatory framework of the Stark Law is to first prohibit all referrals from physicians to entities for Medicare DHS and then to except certain types of arrangements from that broad general prohibition.

State self-referral laws and regulations vary significantly based on the state and, in many cases, have not been interpreted by courts or regulatory agencies. These state laws and regulations can encompass not only services reimbursed by Medicaid or government payers but also private payers. Violation of these federal and state laws and regulations may result in prohibition of payment for services rendered, loss of licenses, $15,000 civil monetary penalties for specified infractions, $100,000 for a circumvention scheme, criminal penalties, exclusion from Medicare and Medicaid programs, and potential false claims liability, including via "qui tam" action, of not less than $5,500 and not more than $11,000, plus three times the amount of damages that the government sustains because of an improperly submitted claim. The repayment provisions in the Stark Law are not dependent on the parties having an improper intent; rather, the Stark Law is a strict liability statute and any violation is subject to repayment of all "tainted" referrals.

Our compensation and other financial arrangements with physicians are governed by the federal Stark Law. We rely on certain exceptions to the Stark Law, including those covering employees and in-office ancillary services, and the exclusion of certain requests by radiation oncologists for radiation therapy services from the definition of "referral." In a limited number of markets, we have relationships with non-radiation oncology physicians such as surgical and gynecological oncologists and urologists that are members of a group practice with our radiation oncologists and we rely on the Stark group practice definition and rules with respect to such relationships.

The Health Care Reform Act also imposes new disclosure requirements, including one such requirement on referring physicians under the federal Stark Law to inform patients that they may obtain certain imaging services (e.g. MRI, CT and PET) or other designated health services as specified by the Secretary in the future from a provider other than that physician, his or her group practice, or another physician in his or her group practice. To date, CMS has not indicated that these disclosure requirements will extend to radiation therapy referrals.

While we believe that our financial relationships with physicians and referral practices are in compliance with applicable laws and regulations, we cannot guarantee that government authorities might take a different position. If we were found to be in violation of the Stark Law, we could be subject to civil and criminal penalties, including fines as specified above, exclusion from participation in government and private payer programs and requirements to refund amounts previously received from government and private payers.

In addition, expansion of our operations to new jurisdictions, or new interpretations of laws in our existing jurisdictions, could require structural and organizational modifications of our relationships with physicians to comply with that jurisdiction's laws. Such structural and organizational modifications could result in lower profitability and failure to achieve our growth objectives.

If a federal or state agency asserts a different position or enacts new laws or regulations regarding illegal payments under the Medicare, Medicaid or other governmental programs, we may be subject to civil and criminal penalties, experience a significant reduction in our revenue or be excluded from participation in the Medicare, Medicaid or other governmental programs.

Any change in interpretations or enforcement of existing or new laws and regulations could subject our current business practices to allegations of impropriety or illegality, or could require us to make changes in our treatment centers, equipment, personnel, services, pricing or capital expenditure programs, which could increase our operating expenses and have a material adverse effect on our operations or reduce the demand for or profitability of our services.

Additionally, new federal or state laws may be enacted that would cause our relationships with our radiation oncologists or other physicians to become illegal or result in the imposition of penalties against us or our treatment centers. If any of our business arrangements with our radiation oncologists or other physicians in a position to make referrals of radiation therapy services were deemed to violate the federal anti-kickback statute or similar laws, or if new federal or state laws were enacted rendering these arrangements illegal, our business would be adversely affected.

Our costs and potential risks have increased as a result of the regulations relating to privacy and security of patient information.

There are numerous federal and state laws and regulations addressing patient information privacy and security concerns, including state laws related to identity theft. In particular, the federal regulations issued under HIPAA contain provisions that:

- protect individual privacy by limiting the uses and disclosures of patient information;
- require notifications to individuals, and in certain cases to government agencies and the media, in the event of a breach of unsecured protected health information;
- require the implementation of security safeguards to ensure the confidentiality, integrity and availability of individually identifiable health information in electronic form; and
- prescribe specific transaction formats and data code sets for certain electronic healthcare transactions.

Compliance with these regulations requires us to spend money and substantial time and resources. We believe that we are in material compliance with the HIPAA regulations with which we are currently required to comply. If we fail to comply with the HIPAA regulations, we could suffer civil penalties up to $50,000 per violation, not to exceed $1.5 million per calendar year and criminal penalties with fines up to $250,000 per violation. Our facilities could be subject to a periodic audit by the federal government, and enforcement of HIPAA violations may occur by either federal agencies or state attorneys general.

State law limitations and prohibitions on the corporate practice of medicine may materially harm our business and limit how we can operate.

State governmental authorities regulate the medical industry and medical practices extensively. Many states have corporate practice of medicine laws which prohibit us from:

- employing physicians;
- practicing medicine, which, in some states, includes managing or operating a radiation treatment center;
- certain types of fee arrangements with physicians;
- owning or controlling equipment used in a medical practice;
- setting fees charged for physician services;
- controlling the content of physician advertisements;
- billing and coding for services;
- pursuing relationships with physicians and other referral sources; or
- adding facilities and services.

In addition, many states impose limits on the tasks a physician may delegate to other staff members. We have administrative services agreements in states that prohibit the corporate practice of medicine such as California, Massachusetts, Michigan, Nevada, New York and North Carolina. Corporate practice of medicine laws and their interpretation vary from state to state, and regulatory authorities enforce them with broad discretion. We have structured our agreements and services in those states in a manner that we believe complied with the law and its interpretation by government authorities. If, however, we are deemed to be in violation of these laws, we could be required to restructure or terminate our agreements which could materially harm our business and limit how we operate. In the event the corporate practice of medicine laws of other states would adversely limit our ability to operate, it could prevent us from expanding into the particular state and impact our growth strategy.

In certain states we depend on administrative services agreements with professional corporations, including related party professional corporations, and if we are unable to continue to enter into them or they are terminated, we could be materially harmed.

Certain states, including California, Massachusetts, Michigan, Nevada, New York and North Carolina, have laws prohibiting business corporations from employing physicians. Our treatment centers in California, Massachusetts, Michigan, Nevada, New York and North Carolina, operate through administrative services agreements with professional corporations that employ the radiation oncologists who provide professional services at the treatment centers in those states. In 2009, 2010 and 2011, $122.2 million, $118.4 million and $114.7 million, respectively, of our net patient service revenue was derived from administrative services agreements, as opposed to $395.4 million, $417.5 million and $524.0 million, respectively, from all of our other centers. The professional corporations in these states

are currently owned by certain of our directors, executive officers and equityholders, who are licensed to practice medicine in those states. As we enter into new states that will require an administrative services agreement, there can be no assurance that a related party professional corporation, or any professional corporation, will be willing or able to enter into an administrative services agreement. Furthermore, if we enter into an administrative services agreement with an unrelated party there could be an increased risk of differences arising or future termination. We cannot assure you that a professional corporation will not seek to terminate an agreement with us on any basis, including on the basis of state laws prohibiting the corporate practice of medicine nor can we assure you that governmental authorities in those states will not seek termination of these arrangements on the same basis. While we have not been subject to such proceedings in the past, nor are we currently aware of any other corporations that are subject to such proceedings, we could be materially harmed if any state governmental authorities or the professional corporations with which we have an administrative services agreement were to succeed in such a termination.

Our business could be materially harmed by future interpretation or implementation of state laws regarding prohibitions on fee-splitting.

Many states prohibit the splitting or sharing of fees between physicians and non-physicians, as well as between treating physicians and referral sources. These laws vary from state to state and are enforced by courts and regulatory agencies, each with broad discretion. Some states have interpreted certain types of fee arrangements in practice management agreements between entities and physicians as unlawful fee-splitting. We believe our arrangements with physicians comply in all material respects with the fee-splitting laws of the states in which we operate. Nevertheless, if government regulatory authorities were to disagree, we and our radiation oncologists could be subject to civil and criminal penalties, and we could be required to restructure or terminate our contractual and other arrangements, which would result in a loss of revenue and could result in less input into the business decisions of such practices. In addition, expansion of our operations to other states with certain types of fee-splitting prohibitions may require structural and organizational modification to the form of relationships that we currently have with physicians, professional corporations and hospitals.

If we fail to comply with the laws and regulations applicable to our treatment center operations, we could suffer penalties or be required to make significant changes to our operations.

Our treatment center operations are subject to many laws and regulations at the federal, state and local government levels. These laws and regulations require that our treatment centers meet various licensing, certification and other requirements, including those relating to:

- qualification of medical and support persons;
- pricing of services by healthcare providers;
- the adequacy of medical care, equipment, personnel, operating policies and procedures;
- clinic licensure and certificates of need;
- maintenance and protection of records; or
- environmental protection, health and safety.

While we have structured our operations in a manner that we believe complies in all material respects with all applicable laws and regulations, we cannot assure you that government regulators will agree, given the breadth and complexity of such laws. If a government agency were to find that we are not in compliance with these laws, we could suffer civil or criminal penalties, including becoming the subject of cease and desist orders, rejection of the payment of our claims, the loss of our licenses to operate and our ability to participate in government or private healthcare programs.

Our business may be harmed by technological and therapeutic changes.

The treatment of cancer patients is subject to potential revolutionary technological and therapeutic changes. Future technological developments could render our equipment obsolete. We may incur significant costs in replacing or modifying equipment in which we have already made a substantial investment prior to the end of its anticipated useful life. In addition, there may be significant advances in other cancer treatment methods, such as chemotherapy, surgery, biological therapy, or in cancer prevention techniques, which could reduce demand or even eliminate the need for the radiation therapy services we provide.

Our growth strategy depends in part on our ability to acquire and develop additional treatment centers on favorable terms. If we are unable to do so, our future growth could be limited and our operating results could be adversely affected.

We may be unable to identify, negotiate and complete suitable acquisition and development opportunities on reasonable terms. We began operating our first radiation treatment center in 1983, and provide radiation therapy at all of our treatment centers. We expect to continue to add additional treatment centers in our existing and new local markets. Our growth, however, will depend on several factors, including:

- our ability to obtain desirable locations for treatment centers in suitable markets;
- our ability to identify, recruit and retain or affiliate with a sufficient number of radiation oncologists and other healthcare professionals;
- our ability to obtain adequate financing to fund our growth strategy; and
- our ability to successfully operate under applicable government regulations.

Growth through acquisitions is a primary component of our business strategy. We continually evaluate potential acquisitions and intend to actively pursue acquisition opportunities, some of which could be material. Future acquisitions could be financed by internally generated funds, bank borrowings, public offerings or private placements of equity or debt securities, or a combination of the foregoing. There can be no assurance that we will be able to make acquisitions on terms favorable to us or at all. If we complete acquisitions, we will encounter various associated risks, including the possible inability to integrate an acquired business into our operations, goodwill impairment, diversion of management's attention and unanticipated problems or liabilities, some or all of which could have a material adverse effect on our operations and financial performance. See "Risk Factors—We may encounter numerous business risks in acquiring and developing additional treatment centers, and may have difficulty operating and integrating those treatment centers."

We may encounter numerous business risks in acquiring and developing additional treatment centers, and may have difficulty operating and integrating those treatment centers.

Over the past three years we have acquired 35 treatment centers and developed 10 treatment centers. When we acquire or develop additional treatment centers, we may:

- be unable to successfully operate the treatment centers;
- have difficulty integrating their operations and personnel;
- be unable to retain radiation oncologists or key management personnel;
- acquire treatment centers with unknown or contingent liabilities, including liabilities for failure to comply with healthcare laws and regulations;

- experience difficulties with transitioning or integrating the information systems of acquired treatment centers;
- be unable to contract with third-party payers or attract patients to our treatment centers; and/or
- experience losses and lower gross revenues and operating margins during the initial periods of operating our newly-developed treatment centers.

Larger acquisitions can substantially increase our potential exposure to business risks. Furthermore, integrating a new treatment center could be expensive and time consuming, and could disrupt our ongoing business and distract our management and other key personnel.

We may from time to time explore acquisition opportunities outside of the United States when favorable opportunities are available to us. In addition to the risks set forth herein, foreign acquisitions involve unique risks including the particular economic, political and regulatory risks associated with the specific country, currency risks, the relative uncertainty regarding laws and regulations and the potential difficulty of integrating operations across different cultures and languages.

We currently plan to continue to acquire and develop new treatment centers in existing and new local markets. We may not be able to structure economically beneficial arrangements in new markets as a result of healthcare laws applicable to such market or otherwise. If these plans change for any reason or the anticipated schedules for opening and costs of development are revised by us, we may be negatively impacted. There can be no assurance that these planned treatment centers will be completed or that, if developed, will achieve sufficient patient volume to generate positive operating margins. If we are unable to timely and efficiently integrate an acquired or newly-developed treatment center, our business could suffer. In addition, we may incur significant transaction fees and expenses even for potential transactions that are not consummated.

Efforts to regulate the construction, acquisition or expansion of healthcare treatment centers could prevent us from developing or acquiring additional treatment centers or other facilities or renovating our existing treatment centers.

Many states have enacted certificate of need laws which require prior approval for the construction, acquisition or expansion of healthcare treatment centers. In giving approval, these states consider the need for additional or expanded healthcare treatment centers or services. In the states of Kentucky, Massachusetts, Michigan, North Carolina, Rhode Island, South Carolina and West Virginia in which we currently operate, certificates of need must be obtained for capital expenditures exceeding a prescribed amount, changes in capacity or services offered and various other matters. Other states in which we now or may in the future operate may also require certificates of need under certain circumstances not currently applicable to us. We cannot assure you that we will be able to obtain the certificates of need or other required approvals for ongoing, additional or expanded treatment centers or services in the future. In addition, at the time we acquire a treatment center, we may agree to replace equipment or expand the acquired treatment center. If we are unable to obtain required approvals, we may not be able to acquire additional treatment centers or other facilities, expand the healthcare services we provide at these treatment centers or replace equipment or expand acquired treatment centers.

We are exposed to local business risks in different countries, which could have a material adverse effect on our financial condition or results of operations.

We have recently commenced significant operations in foreign countries. Currently, we operate through 22 legal entities in Argentina, the Dominican Republic, Costa Rica, Mexico and El Salvador, in

addition to our operations in the United States. Our offshore operations are subject to risks inherent in doing business in foreign countries, including, but not necessarily limited to:

- new and different legal and regulatory requirements in local jurisdictions, which may conflict with U.S. laws;
- local economic conditions;
- potential staffing difficulties and labor disputes;
- increased costs of transportation or shipping;
- credit risk and financial conditions of government, commercial and patient payors;
- risk of nationalization of private enterprises by foreign governments;
- potential imposition of restrictions on investments;
- potential declines in government and/or private payer reimbursement amounts for our services;
- potentially adverse tax consequences, including imposition or increase of withholding and other taxes on remittances and other payments by subsidiaries;
- foreign currency exchange restrictions and fluctuations; and
- local political and social conditions, including the possibility of hyperinflationary conditions and political instability in certain countries.

We may not be successful in developing and implementing policies and strategies to address the foregoing factors in a timely and effective manner at each location where we do business. Consequently, the occurrence of one or more of the foregoing factors could have a material adverse effect on our international operations or upon our financial condition and results of operations.

Further, our international operations require us to comply with a number of United States and international regulations. For example, we must comply with the Foreign Corrupt Practices Act ("FCPA"), which prohibits U.S. companies or their agents and employees from providing anything of value to a foreign official or agent thereof for the purposes of influencing any act or decision of these individuals in their official capacity to help obtain or retain business, direct business to any person or corporate entity or obtain any unfair advantage. Any failure by us to ensure that our employees and agents comply with the FCPA and applicable laws and regulations in foreign jurisdictions could result in substantial penalties or restrictions on our ability to conduct business in certain foreign jurisdictions, and our results of operations and financial condition could be materially and adversely affected.

Fluctuations in currency exchange rates may significantly impact our results of operations and may significantly affect the comparability of our results between financial periods.

Some of our operations are conducted by subsidiaries in foreign countries. The results of the operations and the financial position of these subsidiaries are reported in the relevant foreign currencies and then translated into U.S. dollars at the applicable exchange rates for inclusion in our consolidated financial statements. The main currency to which we are exposed, besides the U.S. dollar, is the Argentine peso. The exchange rate between the Argentine peso and the U.S. dollar in recent years has fluctuated significantly and may continue to do so in the future. A depreciation of this currency against the U.S. dollar will decrease the U.S. dollar equivalent of the amounts derived from these operations reported in our consolidated financial statements and an appreciation of this currency will result in a corresponding increase in such amounts. In addition, currency fluctuations may affect the comparability of our results of operations between financial periods.

We incur currency transaction risk whenever we enter into a transaction using a currency other than the local currency of the transacting entity. Given the volatility of exchange rates, there can be no assurance that we will be able to effectively manage our currency transaction risks or that any volatility in currency exchange rates will not have a material adverse effect on our financial condition or results of operations.

Our financial results may suffer if we have to write-off goodwill or other intangible assets.

A significant portion of our total assets consist of goodwill and other intangible assets. Goodwill and other intangible assets, net of accumulated amortization, accounted for approximately 60% and 69% of the total assets on our balance sheet as of December 31, 2011 and 2010, respectively. We may not realize the value of our goodwill or other intangible assets. We expect to engage in additional transactions that will result in our recognition of additional goodwill or other intangible assets. We evaluate on a regular basis whether events and circumstances have occurred that indicate that all or a portion of the carrying amount of goodwill or other intangible assets may no longer be recoverable, and is therefore impaired. Under current accounting rules, any determination that impairment has occurred would require us to write-off the impaired portion of our goodwill or the unamortized portion of our intangible assets, resulting in a charge to our earnings. Such a write-off could have a material adverse effect on our financial condition and results of operations. For the year ended December 31, 2010, we wrote-off approximately $91.2 million in goodwill as a result of our annual impairment test and an additional $2.5 million as a result of closing certain radiation treatment centers. For the year ended December 31, 2011, we wrote-off approximately $360.6 million in goodwill, trade name, leasehold improvements and other investments as a result of our annual impairment testing of our goodwill and indefinite-lived intangible assets and rebranding initiatives relating to our trade name.

Our information systems are critical to our business and a failure of those systems could materially harm us.

We depend on our ability to store, retrieve, process and manage a significant amount of information, and to provide our radiation treatment centers with efficient and effective accounting and scheduling systems. Our information systems require maintenance and upgrading to meet our needs, which could significantly increase our administrative expenses. We are currently upgrading multiple systems and migrating to other systems within our organization.

Furthermore, any system failure that causes an interruption in service or availability of our systems could adversely affect operations or delay the collection of revenues. Even though we have implemented network security measures, our servers are vulnerable to computer viruses, break-ins and similar disruptions from unauthorized tampering. The occurrence of any of these events could result in interruptions, delays, the loss or corruption of data, or cessations in the availability of systems, all of which could have a material, adverse effect on our financial position and results of operations and harm our business reputation.

The performance of our information technology and systems is critical to our business operations. Our information systems are essential to a number of critical areas of our operations, including:

- accounting and financial reporting;
- billing and collecting accounts;
- coding and compliance;
- clinical systems;
- medical records and document storage;
- inventory management;

- negotiating, pricing and administering managed care contracts and supply contracts; and
- monitoring quality of care and collecting data on quality measures necessary for full Medicare payment updates.

If we fail to effectively and timely implement electronic health record systems, our operations could be adversely affected.

As required by the American Recovery and Reinvestment Act of 2009, the DHHS has developed and is implementing an incentive payment program for eligible healthcare professionals that adopt and meaningfully use certified electronic health record ("EHR") technology. If our radiation treatment centers are unable to meet the requirements for participation in the incentive payment program, we will not be eligible to receive incentive payments that could offset some of the costs of implementing EHR systems. Further, beginning in 2015, eligible healthcare professionals that fail to demonstrate meaningful use of certified EHR technology will be subject to reduced payments from Medicare. Failure to implement EHR systems effectively and in a timely manner could have a material, adverse effect on our financial position and results of operations.

We are addressing a previous material weakness with respect to our internal controls.

In connection with the audit of our consolidated financial statements as of and for the year ended December 31, 2009, we identified a material weakness in internal controls relating to the preparation of the income tax accounts. We have taken steps since then to remediate the internal control weakness such that at December 31, 2010, our controls over income taxes are operating effectively. During 2010, we continued remediation over the preparation of the income tax accounts and as of December 31, 2010, we remediated and implemented certain processes and procedures to improve our calculation of our tax provision and our reconciliation of the tax balance sheet accounts. We have continued to improve our processes and procedures related to the preparation of the income tax accounts throughout 2011. As we further optimize and refine our income tax provision processes, we will review the related controls and may take additional steps to ensure that they remain effective and are integrated appropriately. While we have implemented the procedures described above and will continue to take further steps in the near future to strengthen further our internal controls, there can be no assurance that we will not identify control deficiencies in the future or that such deficiencies will not have a material impact on our operating results or financial statements.

A significant number of our treatment centers are concentrated in certain states, particularly Florida, which makes us sensitive to regulatory, economic and other conditions in those states.

Our Florida treatment centers accounted for approximately 46%, 45% and 40% of our freestanding radiation revenues during the years ended December 31 2009, 2010 and 2011, respectively. Our treatment centers are also concentrated in the states of Michigan and North Carolina, which accounted for approximately 3.5% and 6.5%, respectively, of our freestanding radiation revenues for the year ended December 31, 2011. This concentration makes us particularly sensitive to regulatory requirements in those locations, including those related to false and improper claims, anti-kickback laws, self-referral laws, fee-splitting, corporate practice of medicine, anti-trust, licensing and certificates of need, as well as economic and other conditions which could impact us. If our treatment centers in these states are adversely affected by changes in regulatory, economic and other conditions, our revenue and profitability may decline.

Our treatment centers in Florida and other areas that could be disrupted or damaged by hurricanes.

Florida is susceptible to hurricanes and we currently have 30 radiation treatment centers located in Florida. Our Florida centers accounted for approximately 46%, 45% and 40% of our freestanding

radiation revenues during the years ended December 31 2009, 2010 and 2011, respectively. In 2005, 21 of our treatment centers in South Florida were disrupted by Hurricane Wilma which required us to close all of these centers for one business day. Although none of these treatment centers suffered structural damage as a result of the hurricane, their utility services were disrupted. While Hurricane Wilma did not have any long-term impact on our business, our Florida treatment centers and any of our other treatment centers located in other areas that are in the path of a hurricane could be subject to significant hurricane-related disruptions and/or damage in the future and could have an adverse affect on our business and financial results. We carry property damage and business interruption insurance on our facilities, but there can be no assurance that it would be adequate to cover all of our hurricane-related losses.

We have potential conflicts of interest relating to our related party transactions which could harm our business.

We have potential conflicts of interest relating to existing agreements we have with certain of our directors, executive officers and equityholders. In 2009, 2010 and 2011, we paid an aggregate of $17.1 million, $19.9 million and $21.5 million, respectively, under certain of our related party agreements, including leases, and we received $89.3 million, $85.6 million and $82.7 million, respectively, pursuant to our administrative services agreements with related parties. Potential conflicts of interest can exist if a related party has to make a decision that has different implications for us and the related party. If a dispute arises in connection with any of these agreements, if not resolved satisfactorily to us, our business could be harmed. These agreements include

- administrative services agreements with professional corporations that are owned by certain of our directors, executive officers and equityholders;
- leases we have entered into with entities owned by certain of our directors, executive officers and equityholders; and
- medical malpractice insurance which we acquire from an entity owned by certain of our directors, executive officers and equityholders.

In California, Maryland, Massachusetts, Michigan, Nevada, New York and North Carolina, we have administrative services agreements with professional corporations that are owned by certain of our directors, executive officers and equityholders who own interests in these professional corporations. While we have transition services agreements corresponding to our administrative services agreements in place in all states except New York that provide us with the ability to designate qualified successor physician owners of the shares held by the physician owners of these professional corporations upon the occurrence of certain events, there can be no assurance that we will be able to enforce them under the laws of the respective states or that they will not be challenged by regulatory agencies. Potential conflicts of interest may arise in connection with the administrative services agreements that may have materially different implications for us and the professional corporations and there can be no assurance that it will not harm us. For example, we bill for such services either on a fixed basis, percentage of net collections basis, or on a per treatment basis, depending on the particular state requirements and certain of these arrangements are subject to renegotiation on an annual basis. We may be unable to renegotiate acceptable fees, in which event many of the administrative services agreements provide for binding arbitration. If we are unsuccessful in renegotiations or arbitration this could negatively impact our operating margins or result in the termination of our administrative services agreements.

Additionally, we lease 34 of our properties from ownership groups that consist of certain of our directors, executive officers and equityholders. Our lease for the Broadway office in Fort Myers, Florida is on a month-to-month basis and there can be no assurance that it will continue in the future. We may be unable to renegotiate these leases when they come up for renewal on terms acceptable to us, if at all.

In October 2003, we replaced our existing third-party medical malpractice insurance coverage with coverage we obtained from an insurance entity which is owned by certain of our directors, executive officers and equityholders. We renewed this coverage in 2009, 2010 and 2011, with the approval of the Audit/Compliance Committee of the Company's board of directors. We may be unable to renegotiate this coverage at acceptable rates and comparable coverage may not be available from third-party insurance companies. If we are unsuccessful in renewing our malpractice insurance coverage, we may not be able to continue to operate without being exposed to substantial risks of claims being made against us for damage awards we are unable to pay.

Related party transactions between us and any related party are subject to approval by the Audit/ Compliance Committee on behalf of the Company's board of directors or by the Company's board of directors, and disputes are handled by the Company's board of directors. There can be no assurance that the above or any future conflicts of interest will be resolved in our favor. If not resolved, such conflicts could harm our business. For a further description of our related party transactions, see "Item 13. Certain Relationships and Related Party Transactions, and Director Independence."

Our failure to comply with laws related to hazardous materials could materially harm us.

Our treatment centers provide specialized treatment involving the use of radioactive material in the treatment of the lungs, prostate, breasts, cervix and other organs. The materials are obtained from, and, if not permanently placed in a patient or consumed, returned to, a third-party provider of supplies to hospitals and other radiation therapy practices, which has the ultimate responsibility for its proper disposal. We, however, remain subject to state and federal laws regulating the protection of employees who may be exposed to hazardous material and regulating the proper handling, storage and disposal of that material. Although we believe we are in compliance in all material respects with all applicable laws, a violation of such laws, or the future enactment of more stringent laws or regulations, could subject us to liability, or require us to incur costs that could have a material adverse effect on us.

In response to a number of articles concerning the risk of significant (sometimes fatal) errors in radiation therapy, especially relating to linear radiation, accreditation of facilities and the establishment of a national error reporting database are under consideration.

Several articles have been published discussing the risks of (sometimes fatal) errors in radiation therapy treatment, especially those relating to linear accelerators. In response, American College of Radiation Oncology ("ACRO") has called for required accreditation of all facilities which bill Medicare for advanced medical imaging and radiation oncology services, including those in hospitals. In addition, the American Society for Radiation Oncology called for the establishment of the nation's first central database for the reporting of errors involving linear accelerators and CT scanners. Federal legislation in these areas is under consideration and a congressional hearing was recently held.

Of our 96 domestic U.S. treatment centers, 79 have received or are in process of receiving ACRO accreditation. In addition to a deep physics infrastructure and internal maintenance department, we have recently begun to utilize Gamma Function as a broad application radiation safety monitoring tool to minimize potential errors in our radiation therapy treatments. While we continue to improve upon safety measures aimed at minimizing errors in radiation therapy treatment in accordance with our internal protocols as well as the mandates of organizations like ACRO, we cannot assure you that any further critical press and government scrutiny will not adversely affect our business and results of operations.

We may be subject to liabilities from claims brought against our facilities.

We could be subject to litigation relating to our business practices, including claims and legal actions by patients and others in the ordinary course of business alleging malpractice, product liability

or other legal theories. For a discussion of current pending material litigation against us, see "Item 3. Legal Proceedings."

If payments for claims exceed actuarially determined estimates, are not covered by insurance, or reinsurers, if any, fail to meet their obligations, our results of operations and financial position could be adversely affected.

Our financial results could be adversely affected by the increasing costs of professional liability insurance and by successful malpractice claims.

We are exposed to the risk of professional liability and other claims against us and our radiation oncologists and other physicians and professionals arising out of patient medical treatment at our treatment centers. Our risk exposure as it relates to our non-radiation oncology physicians could be greater than with our radiation oncologists to the extent such non-radiation oncology physicians are engaged in diagnostic activities. Malpractice claims, if successful, could result in substantial damage awards which might exceed the limits of any applicable insurance coverage. Insurance against losses of this type can be expensive and insurance premiums may increase in the near future. Insurance rates vary from state to state, by physician specialty and other factors. The rising costs of insurance premiums, as well as successful malpractice claims against us or one of our physicians, could have a material adverse effect on our financial position and results of operations.

It is also possible that our excess liability and other insurance coverage will not continue to be available at acceptable costs or on favorable terms. In addition, our insurance does not cover all potential liabilities arising from governmental fines and penalties, indemnification agreements and certain other uninsurable losses. For example, from time to time we agree to indemnify third parties, such as hospitals and clinical laboratories, for various claims that may not be covered by insurance. As a result, we may become responsible for substantial damage awards that are uninsured.

If payment for claims exceed actuarially determined estimates, are not covered by insurance, or reinsurers, if any, fail to meet their obligations, our results of operations and financial position could be adversely affected.

We are indirectly owned and controlled by Vestar and its interests may conflict with yours as a noteholder.

Vestar indirectly controls approximately 81% of the Class A voting equity units of RT Investments LLC, which controls us, and which in turn controls Radiation Therapy Services, Inc. ("RTS"). As a result, they have the power to elect a majority of RTS's board of directors and effectively have control over major decisions regardless of whether noteholders believe that any such decisions are in their own best interests. The interests of Vestar as an equity holder may conflict with your interests as a noteholder of RTS. Vestar may have an incentive to increase the value of their investment or cause us to distribute funds at the expense of our financial condition and affect our ability to make payments on the notes. In addition, Vestar may have an interest in pursuing acquisitions, divestitures, financings or other transactions that it believes could enhance its equity investments even though such transactions might involve risks to you as a noteholder of RTS.

Item 1B. ***Unresolved Staff Comments***

None

Item 2. ***Properties***

Our executive and administrative offices are located in Fort Myers, Florida. These offices contain approximately 79,000 square feet of space. We also lease approximately 5,600 square feet of administrative office space in Florence, Kentucky pursuant to an operating lease that expires April 30,

2012. These offices will be adequate for our current primary needs, we also believe that we will require significant additional space to meet our future needs and such future expansion is in the preliminary stages.

Our radiation treatment centers typically range in size from 5,000 to 12,000 square feet. We currently operate 127 radiation treatment centers in Alabama, Arizona, California, Delaware, Florida, Kentucky, Maryland, Massachusetts, Michigan, Nevada, New Jersey, New York, North Carolina, Rhode Island, South Carolina, West Virginia and in international markets in South America, Central America and the Caribbean located in Argentina, Mexico, Costa Rica, Dominican Republic, Guatemala and El Salvador. We own the real estate on which four of our treatment centers are located. We lease land and space at 114 treatment center locations, of which in 34 of these locations, certain of our directors, executive officers and equityholders have an ownership interest. These leases expire at various dates between 2012 and 2044 and 71 of these leases have one or more renewal options of five or 10 years. Also, nine of our treatment center locations are in hospital-based and other group facilities. We consider all of our offices and treatment centers to be well-suited to our present requirements. However, as we expand to additional treatment centers, or where additional capacity is necessary in a treatment center, additional space will be obtained where feasible. For further information relating to our properties and treatment centers, can be found in Item 1 of this report under the caption, "Business—Treatment Centers."

Item 3. ***Legal Proceedings***

We are involved in certain legal actions and claims that arise in the ordinary course of our business. We do not believe that an adverse decision in any of these matters would have a material adverse effect on our consolidated financial position, results of operations or cash flows.

Item 4. ***Mine Safety Disclosures***

Not applicable to Radiation Therapy Services Holdings, Inc.

PART II

Item 5. *Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities*

Market Information

We are a direct wholly owned subsidiary of RT Investments. Accordingly, there is no public trading market for our common stock.

Stockholders

As of March 1, 2012, there was one owner of record of our common stock, RT Investments.

Dividends

We have not paid cash dividends on our common stock and we do not anticipate paying any cash dividends in the foreseeable future.

Our senior secured credit facilities and the indenture governing the senior subordinated notes generally prohibit the payment of dividends by us on shares of our common stock, with certain limited exceptions.

Equity Compensation Plan Information

The following table lists the number of securities of RT Investments available for issuance as of December 31, 2011 under the RT Investments equity-based incentive plan, as amended. For a description of the plan, please see note 16 to the consolidated financial statements included elsewhere in this Annual Report on Form 10-K.

Plan Category	Number of Securities to be Issued Upon Exercise of Outstanding Options (a)	Weighted-Average Exercise Price of Outstanding Options (b)	Number of Securities Remaining Available for Future Issuance under Equity Compensation Plans (excluding Securities Reflected in Column(a))
Equity compensation plans approved by security holders	N/A	N/A	Non-voting preferred equity units: 4,874 Voting Class A equity units: 22,608 Non-voting Class B equity units: 13,815 Non-voting Class C equity units: 51,040
Equity compensation plans not approved by security holders	N/A	N/A	N/A
TOTAL	—	—	Non-voting preferred equity units: 4,874 Voting Class A equity units: 22,608 Non-voting Class B equity units: 13,815 Non-voting Class C equity units: 51,040

Unregistered Sales of Equity Securities

On March 1, 2011, 25 shares of common stock of the Company were issued in connection with our acquisition of MDLLC, which we refer to herein as the "MDLLC Acquisition". In addition, the Company's direct parent, RT Investments issued 13,660 Preferred Units and 258,955 Class A Units as a component of the consideration in the MDLLC Acquisition.

The Company's direct parent, RT Investments, sold equity securities during this period. The following table sets forth the number of units of common equity of RT Investments issued during 2011 pursuant to the RT Investments equity-based incentive plan, as amended. The units were granted under Rule 701 promulgated under the Securities Act.

Dates	Title of Securities	Amount	Purchasers	Consideration
March 1, 2011	Class B non-voting equity units	12,499	Key Employee	$3,125
	Class C non-voting equity units	32,325	Key Employee	$1,616
March 1, 2011	Class B non-voting equity units	20,831	One Officer	$5,208
	Class C non-voting equity units	53,874	One Officer	$2,694
March 14, 2011	Class B non-voting equity units	2,083	Key Employee	$ 521
	Class C non-voting equity units	5,387	Key Employee	$ 269
March 14, 2011	Class B non-voting equity units	4,166	Key Employee	$1,042
	Class C non-voting equity units	10,775	Key Employee	$ 539
July 5, 2011	Class B non-voting equity units	2,083	Key Employee	$ 521
	Class C non-voting equity units	5,387	Key Employee	$ 269

Repurchases of Equity Securities

The Company's direct parent, RT Investments repurchased the following equity units during 2011:

Dates	Title of Securities	Amount	Repurchase From	Consideration
March 1, 2011	Class B non-voting equity units	33,330	One Officer	$8,333
	Class C non-voting equity units	86,199	One Officer	$4,310

Item 6. ***Selected Financial Data***

The following selected historical consolidated financial data as of and for the years ended December 31, 2009, 2010 and 2011 (Successor) were derived from our audited consolidated financial statements, included elsewhere in this Annual Report on Form 10-K. All adjustments necessary for a fair presentation have been included. All such adjustments are considered to be of a normal recurring nature. The selected historical consolidated financial data as of December 31, 2007 and for the year then ended (Predecessor) and for the period from January 1 to February 21, 2008 (Predecessor), and the period from February 22 to December 31, 2008 (Successor) were derived from our audited consolidated financial statements, adjusted for the retrospective presentation impact of changes in accounting guidance related to non-controlling interests, which are not included in this Annual Report on Form 10-K. On October 19, 2007, our wholly owned subsidiary, Radiation Therapy Services, Inc. ("RTS"), entered into an Agreement and Plan of Merger (the "Merger Agreement") with Radiation Therapy Investments, LLC ("RT Investments"), Parent and RTS MergerCo, Inc., a wholly owned subsidiary of Parent, pursuant to which RTS MergerCo, Inc. was merged with and into RTS with RTS as the surviving corporation and as a wholly-owned subsidiary of Parent (the "Merger"). As a result of the purchase accounting treatment applied for the Merger, our audited consolidated financial statements include the consolidated accounts of the Successor as of December 31, 2011, 2010 and 2009. For dates prior to February 22, 2008, our audited consolidated financial statements are of the Predecessor. These statements have been prepared using the Predecessor's basis in the assets and liabilities and the historical results of operations for periods prior to the Merger. Periods subsequent to February 22, 2008 have been prepared using our basis in the assets and liabilities acquired in the purchase transaction. Our historical results included below and elsewhere in this Annual Report on Form 10-K are not necessarily indicative of our future performance. You should read the following data in conjunction with "Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations," our audited consolidated financial statements and the accompanying notes included

elsewhere in this Annual Report on Form 10-K, and other financial information included in this Annual Report on Form 10-K.

	Predecessor		Successor			
	Year Ended December 31, 2007	Period From January 1 to February 21, 2008	Period From February 22 to December 31, 2008	Year Ended December 31, 2009	Year Ended December 31, 2010	Year Ended December 31, 2011
(in thousands):						
Consolidated Statements of Operations Data:						
Net patient service revenue	$381,586	$ 76,927	$ 413,305	$ 517,646	$ 535,913	$ 638,690
Other revenue	8,595	1,179	5,864	6,838	8,050	6,027
Total revenues	390,181	78,106	419,169	524,484	543,963	644,717
Salaries and benefits	203,408	42,209	206,159	259,532	282,302	326,782
Medical supplies	12,982	2,924	32,545	45,361	43,027	51,838
Facility rent expense	10,877	2,269	13,783	22,106	27,885	33,375
Other operating expenses	17,896	3,102	17,027	24,398	27,103	33,992
General and administrative expenses	45,656	20,340	43,393	54,537	65,798	81,688
Depreciation and amortization	25,776	5,347	32,609	46,416	46,346	54,084
Provision for doubtful accounts	9,648	3,789	17,896	12,871	8,831	16,117
Interest expense, net	19,726	4,721	55,100	62,502	58,505	60,656
Gain on sale of interest in a radiation practice	—	—	(3,113)	—	—	—
Loss on sale of assets of a radiation treatment center	—	—	—	—	1,903	—
Termination of professional services agreement	—	—	7,000	—	—	—
Loss on sale of real estate	—	—	1,036	—	—	—
Loss on investments	—	—	—	—	—	250
Gain on fair value adjustment of previously held equity investment	—	—	—	—	—	(234)
Loss on foreign currency translations	—	—	—	—	—	106
Loss on forward currency derivative contracts	—	—	—	—	—	672
Early extinguishment of debt	—	3,688	—	—	10,947	—
Impairment loss	1,568	—	—	3,474	97,916	360,639
Total expenses	347,537	88,389	423,435	531,197	670,563	1,019,965
Income (loss) before income taxes	42,644	(10,283)	(4,266)	(6,713)	(126,600)	(375,248)
Income tax expense (benefit)	15,525	570	(1,413)	1,002	(12,810)	(25,365)
Net income (loss)	27,119	(10,853)	(2,853)	(7,715)	(113,790)	(349,883)
Net income attributable to non-controlling interests	(1,211)	(19)	(2,483)	(1,835)	(1,698)	(3,558)
Net income (loss) attributable to Radiation Therapy Services Holdings, Inc. shareholder	$ 25,908	$(10,872)	$ (5,336)	$ (9,550)	$ (115,488)	$ (353,441)
Balance Sheet Data (at end of period):						
Cash and cash equivalents	$ 10,310		$ 49,168	$ 32,958	$ 13,977	$ 10,177
Working capital(1)	67,946		93,935	49,970	19,076	19,929
Total assets	582,096		1,405,940	1,379,225	1,236,330	998,592
Finance obligations	34,146		60,605	77,230	8,568	14,266
Total debt	305,159		577,444	549,059	598,831	679,033
Total equity	176,492		629,171	622,007	508,208	177,294
Other Financial Data:						
Ratio of earnings to fixed charges(2)	2.95x	—	—	—	—	—
Deficiency to cover fixed charges(3)	—	10,341	6,631	9,127	128,292	377,137

(1) Working capital is calculated as current assets minus current liabilities.

(2) For purposes of calculating the ratio of earnings to fixed charges, (i) earnings is defined as pretax income (loss) from continuing operations before adjustment for noncontrolling interests in consolidated subsidiaries plus/minus income or loss from equity investees plus fixed charges and (ii) fixed charges is defined as interest expense (including capitalized interest, of which we have none, and any amortization of debt issuance costs) and the estimated portion of operating lease expense deemed by management to represent the interest component of rent expense.

(3) Coverage deficiency represents the amount by which earnings were insufficient to cover fixed charges.

Item 7. ***Management's Discussion and Analysis of Financial Condition and Results of Operations***

The following discussion and analysis should be read in conjunction with the "Selected Financial Data "and the consolidated financial statements and related notes included elsewhere in this Annual Report on Form 10-K. This section of this Annual Report on Form 10-K contains forward-looking statements that involve substantial risks and uncertainties, such as statements about our plans, objectives, expectations and intentions. We use words such as "expect", "anticipate", "plan", "believe", "seek", "estimate", "intend", "future" and similar expressions to identify forward-looking statements. In particular, statements that we make in this section relating to the sufficiency of anticipated sources of capital to meet our cash requirements are forward-looking statements. Our actual results could differ materially from those anticipated in these forward-looking statements for many reasons, including as a result of some of the factors described below and in the section titled "Risk Factors". You are cautioned not to place undue reliance on these forward-looking statements, which speak only as of the date of this Annual Report on Form 10-K.

Overview

We own, operate and manage treatment centers focused principally on providing comprehensive radiation treatment alternatives ranging from conventional external beam radiation, Intensity Modulated Radiation Therapy ("IMRT"), as well as newer, more technologically-advanced procedures. We believe we are the largest company in the United States focused principally on providing radiation therapy. We opened our first radiation treatment center in 1983 and, as of December 31, 2011 we provided radiation therapy services in 127 treatment centers. Most of our treatment centers are strategically clustered into 28 local markets in 16 states, including Alabama, Arizona, California, Delaware, Florida, Kentucky, Maryland, Massachusetts, Michigan, Nevada, New Jersey, New York, North Carolina, South Carolina, Rhode Island, and West Virginia and 30 treatment centers are operated in South America, Central America and the Caribbean and one center located in India. Of these 127 treatment centers, 38 treatment centers were internally developed, 80 were acquired and nine involve hospital-based treatment centers and other groups. We have continued to expand our affiliation with physician specialties in closely related areas including gynecological and surgical oncology and urology in a limited number of our local markets to strengthen our clinical working relationships.

On October 19, 2007, our wholly owned subsidiary, RTS entered into an Agreement and Plan of Merger (the "Merger Agreement") with RT Investments, Parent and RTS MergerCo, Inc., a wholly-owned subsidiary of Parent, pursuant to RTS MergerCo, Inc. was merged with and into RTS with RTS as the surviving corporation and as a wholly-owned subsidiary of Parent (the "Merger"). Upon completion of the Merger, each share of RTS's common stock outstanding immediately prior to the effective time of the Merger (other than certain shares held by members of RT Investments' management team and certain employees) was converted into $32.50 in cash without interest. The Merger was consummated on February 21, 2008 (the "Closing"). Immediately following the Closing, Parent became the owner of all of the outstanding common stock of RTS, which in turn, became a wholly-owned indirect subsidiary of RT Investments, and Vestar and its affiliates became the beneficial owners of approximately 57% of the outstanding Class A voting equity units of RT Investments and its co-investors became the beneficial owners of approximately 26% of the outstanding Class A voting equity units of RT Investments. At December 31, 2011, Vestar and its affiliates currently control approximately 81% of the Class A voting equity units of RT Investments through its ability to directly or indirectly control its co-investors. In addition, at the Closing, the management investors, including current and former directors and executive officers, either exchanged certain shares of RTS's common stock or invested cash in RTS, in each case, in exchange for Class A voting equity units and non-voting preferred equity units of RT Investments. At the Closing, these management investors as a group became the beneficial owners of approximately 17% of the outstanding Class A voting equity units of RT Investments. RT Investments also adopted a management incentive equity plan pursuant to which

certain employees are eligible to receive incentive unit awards (Class B and C non-voting equity units) from an equity pool representing up to 13% of the common equity value of RT Investments, which as of December 31, 2011 was 12.1%. In connection with the Closing, Vestar, its affiliates and these management investors invested approximately $627.3 million in equity units of RT Investments.

We use a number of metrics to assist management in evaluating financial condition and operating performance, and the most important follow:

- The number of relative value units (RVU) delivered per day in our freestanding centers;
- The percentage change in RVUs per day in our freestanding centers;
- The number of treatments delivered per day in our freestanding centers;
- The average revenue per treatment in our freestanding centers;
- The ratio of funded debt to pro-forma adjusted earnings before interest, taxes, depreciation and amortization (leverage ratio) and
- Facility gross profit

Revenue Drivers

Our revenue growth is primarily driven by expanding the number of our centers, optimizing the utilization of advanced technologies at our existing centers and benefiting from demographic and population trends in most of our local markets. New centers are added or acquired based on capacity, demographics, and competitive considerations.

The average revenue per treatment is sensitive to the mix of services used in treating a patient's tumor. The reimbursement rates set by Medicare and commercial payers tend to be higher for more advanced treatment technologies, reflecting their higher complexity. A key part of our business strategy is to make advanced technologies available once supporting economics exist. For example, we have been utilizing IGRT and Gamma Function, a proprietary capability to enable measurement of the actual amount of radiation delivered during a treatment and to provide immediate feedback for adaption of future treatments as well as for quality assurance, where appropriate, now that reimbursement codes are in place for these services.

Operating Costs

The principal costs of operating a treatment center are (1) the salary and benefits of the physician and technical staff, and (2) equipment and facility costs. The capacity of each physician and technical position is limited to a number of delivered treatments, while equipment and facility costs for a treatment center are generally fixed. These capacity factors cause profitability to be very sensitive to treatment volume. Profitability will tend to increase as resources from fixed costs including equipment and facility costs are utilized.

Sources of Revenue By Payer

We receive payments for our services rendered to patients from the government Medicare and Medicaid programs, commercial insurers, managed care organizations and our patients directly. Generally, our revenue is determined by a number of factors, including the payer mix, the number and nature of procedures performed and the rate of payment for the procedures. The following table sets

forth the percentage of our net patient service revenue we earned based upon the patients' primary insurance by category of payer in our last three fiscal years.

Payer (Domestic U.S.)	Year Ended December 31, 2009	2010	2011
Medicare	42.0%	44.6%	44.9%
Commercial	54.7	50.9	50.9
Medicaid	2.4	3.0	2.8
Self pay	0.9	1.5	1.4
Total net patient service revenue	100.0%	100.0%	100.0%

Medicare and Medicaid

Medicare is a major funding source for the services we provide and government reimbursement developments can have a material effect on operating performance. These developments include the reimbursement amount for each Current Procedural Terminology ("CPT") service that we provide and the specific CPT services covered by Medicare. CMS, the government agency responsible for administering the Medicare program, administers an annual process for considering changes in reimbursement rates and covered services. We have played, and will continue to play, a role in that process both directly and through the radiation oncology professional societies.

Since cancer disproportionately affects elderly people, a significant portion of our net patient service revenue is derived from the Medicare program, as well as related co-payments. Medicare reimbursement rates are determined by CMS and are lower than our normal charges. Medicaid reimbursement rates are typically lower than Medicare rates; Medicaid payments represent approximately 2.8% of our net patient service revenue for the year ended December 31, 2011.

Medicare reimbursement rates are determined by a formula which takes into account an industry wide Conversion Factor ("CF") multiplied by Relative Value Units ("RVUs") determined on a per procedure basis. The CF and RVUs may change on an annual basis. In 2009, the CF decreased by 5.3%. The net result of changes to the CF and RVUs over the last several years prior to 2009 has had an immaterial impact on our business, with the CF percentage decrease in 2009 having a significant impact on our business. It is difficult, however, to forecast the future impact of any changes. We depend on payments from government sources and any changes in Medicare or Medicaid programs could result in a decrease in our total revenues and net income.

On January 1, 2010, the CF was scheduled to decrease 21.2%, but Congress postponed this decrease through the end of 2010 by passing several pieces of legislation. Additionally, in June 2010, Congress passed a 2.2% increase. The CF was again scheduled to decrease 24.9% as of January 1, 2011, but Congress further delayed the scheduled cut until the end of 2011. The final Medicare 2012 Physician Fee Schedule, released by CMS on November 1, 2011, would have resulted in a reimbursement decrease of 27.4% as of January 1, 2012. However, Congress again delayed the implementation of this payment cut, first through February 29, 2012 under the Temporary Payroll Tax Cut Continuation Act of 2011, and then through the end of 2012 under the Middle Class Tax Relief and Job Creation Act of 2012. If future reductions are not suspended, and if a permanent "doc fix" is not signed into law, the reimbursement decrease currently scheduled to take effect on January 1, 2013, will have a significant adverse impact on our business.

In the final Medicare 2012 Physician Fee Schedule, CMS indicates that the primary impacts to specialties are due to the third year of the four-year transition to the utilization of the new Physician Practice Information Survey data and the rebasing of the Medicare Economic Index. However, changes also occurred between the 2012 Proposed and Final Physician Fee Schedule that relate to American

Medical Association Relative Value Scale Update Committee, ("AMA RUC") recommendations on certain radiation oncology codes. Because these changes were not included in the 2012 Proposed Physician Fee Schedule, CMS has listed the updated values for these codes as "interim" and has provided a 60-day period for comment. The only Federal Register publication regarding the Physician Fee Schedule since that time, which appeared on January 4, 2012, did not address this issue.

Commercial

Commercial sources include private health insurance as well as related payments for co-insurance and co-payments. We enter into contracts with private health insurance and other health benefit groups by granting discounts to such organizations in return for the patient volume they provide.

Most of our commercial revenue is from managed care business and is attributable to contracts where a set fee is negotiated relative to services provided by our treatment centers. We do not have any contracts that individually represent over 10% of our total net patient service revenue. We receive our managed care contracted revenue under two primary arrangements. Approximately 98% of our managed care business is attributable to contracts where a fee schedule is negotiated for services provided at our treatment centers. Approximately 2% of our net patient service revenue is attributable to contracts where we bear utilization risk. Although the terms and conditions of our managed care contracts vary considerably, they are typically for a one-year term and provide for automatic renewals. If payments by managed care organizations and other private third-party payers decrease, then our total revenues and net income would decrease.

Self Pay

Self pay consists of payments for treatments by patients not otherwise covered by third-party payers, such as government or commercial sources. Because the incidence of cancer is much higher in those over the age of 65, most of our patients have access to Medicare or other insurance and therefore the self-pay portion of our business is less than it would be in other circumstances.

We grant a discount on gross charges to self pay payers not covered under other third party payer arrangements. The discount amounts are excluded from patient service revenue. To the extent that we realize additional losses resulting from nonpayment of the discounted charges, such additional losses are included in the provision for doubtful accounts.

Other Material Factors

Other material factors that we believe will also impact our future financial performance include:

- Patient volume and census;
- Continued advances in technology and the related capital requirements;
- Continued affiliation with physician specialties other than radiation oncology;
- Changes in accounting for business combinations requiring that all acquisition-related costs be expensed as incurred;
- Our ability to achieve identified cost savings and operational efficiencies;
- Increased costs associated with development and optimization of our internal infrastructure; and
- Healthcare reform.

Results of Operations

The following summary results of operations data are qualified in their entirety by reference to, and should be read in conjunction with, our unaudited condensed consolidated financial statements and the accompanying notes and our audited consolidated financial statements and the accompanying notes, included in this Annual Report on Form 10-K, and other financial information included in this Annual Report on Form 10-K.

Years Ended December 31, 2009, 2010 and 2011

For the year ended December 31, 2011, our total revenues grew by 18.5%, over the prior year, while our total revenues for the year ended December 31, 2010 grew by 3.7% over the prior year. For the years ended December 31, 2011, 2010 and 2009, we had total revenues of $644.7 million, $544.0 million and $524.5 million, respectively.

For the years ended December 31, 2011, 2010 and 2009, net patient service revenue comprised 99.1%, 98.5% and 98.7%, respectively, of our total revenues. In states where we employ radiation oncologists, we derive our net patient service revenue through fees earned from the provision of the professional and technical component fees of radiation therapy services. In states where we do not employ radiation oncologists, we derive our administrative services fees principally from administrative services agreements with professional corporations. As of December 31, 2011, we employed the physicians in 86 of our treatment centers and operated pursuant to administrative services agreements in 41 of our treatment centers. In accordance with ASC 810, we consolidate the operating results of certain of the professional corporations for which we provide administrative services into our own operating results. In 2011, 2010 and 2009, 18.0%, 22.1% and 23.6%, respectively, of our net patient service revenue was generated by professional corporations with which we have administrative services agreements.

In our net patient service revenue for the years ended December 31, 2011, 2010, and 2009, revenue from the professional-only component of radiation therapy and revenue from the practices of medical specialties other than radiation oncology, comprised approximately 25.8%, 26.4%, and 24.8%, respectively, of our total revenues.

For the years ended December 31, 2011, 2010 and 2009, other revenue comprised approximately 0.9%, 1.5% and 1.3%, respectively, of our total revenues. Other revenue is primarily derived from management services provided to hospital radiation therapy departments, technical services provided to hospital radiation therapy departments, billing services provided to non-affiliated physicians, gain and losses from sale/disposal of medical equipment, equity interest in net earnings/losses of unconsolidated joint ventures and income for equipment leased by joint venture entities.

The following table summarizes key operating statistics of our results of operations for the periods presented:

Domestic U.S.	Year Ended December 31, 2009	2010	% Change	Year Ended December 31, 2010	2011	% Change
Number of treatment days	255	254		254	255	
Total RVU's—freestanding centers	10,818,119	10,833,260	0.1%	10,833,260	12,366,538	14.2%
RVU's per day—freestanding centers	42,424	42,651	0.5%	42,651	48,496	13.7%
Percentage change in RVU's per day—freestanding centers—same practice basis	2.7%	(2.1)%		(2.1)%	11.6%	
Total treatments—freestanding centers	480,871	478,592	(0.4)%	478,952	491,902	2.7%
Treatments per day—freestanding centers	1,886	1,886	0.0%	1,886	1,929	2.3%
Percentage change in revenue per treatment—freestanding centers—same practice basis	(0.3)%	0.7%		0.7%	1.9%	
Percentage change in treatments per day—freestanding centers—same practice basis	(1.9)%	(4.3)%		(4.3)%	0.4%	
Number of regions at period end (global)	8	8		8	9	
Number of local markets at period end	28	28		28	28	
Treatment centers—freestanding (global)	90	89	(1.1)%	89	118	32.6%
Treatment centers—hospital / other groups (global)	7	6	(14.3)%	6	9	50.0%
	97	95	(2.1)%	95	127	33.7%
Days sales outstanding at quarter end	44	41		41	39	
Percentage change in freestanding revenues—same practice basis	(3.1)%	(3.6)%		(3.6)%	2.7%	
Net patient service revenue—professional services only (in thousands)	$ 129,909	$ 143,487		$ 143,487	$ 166,090	

The following table summarizes key operating statistics of our results of operations for our international operations for the three months and year ended December 31, 2010 and 2011:

International	Three Months Ended December 31, 2010*	Three Months Ended December 31, 2011	% Change	Years Ended December 31, 2010*	Years Ended December 31, 2011*	% Change
Number of treatments						
2-D treatments	1,331	1,404		5,646	5,411	
3-D treatments	1,634	1,875		6,010	6,888	
IMRT treatments	319	453		1,047	1,478	
Total	3,284	3,732	13.6%	12,703	13,777	8.5%

* includes full period operating statistics, including period prior to our acquisition on March 1, 2011

International

MDLLC's net patient service revenue increased $2.6 million, or 14.7%, from $17.7 million to $20.3 million for the three months ended December 31, 2011 as compared to the three months ended September 30, 2011. Total revenue was positively impacted by $1.0 million of revenue from the acquisition of four radiation treatment facilities in November 2011, and the opening of new treatment centers in San Juan, Argentina and San Salvador, El Salvador in February and March 2011, respectively. The continued ramp-up in operations at our Centro de Radiaciones de La Costa and Centro de Radioterapia Siglo XXI subsidiaries in Argentina which opened in May and July 2010, respectively also favorably impacted revenue growth. In addition, we experienced growth in the number of new patient treatments initiated during the quarter by 233 versus the September quarter and 448 versus the prior year's quarter, of which 250 pertained to the acquired operations in November 2011. The trend toward more clinically-advanced treatments continued during the quarter with an increase in the number of higher-revenue 3D and IMRT treatments.

Facility gross profit increased $0.9 million, or 9.0% from $10.0 million to $10.9 million for the three months ended December 31, 2011 as compared to the three months ended September 30, 2011. Facility-level gross profit as a percentage of net patient service revenue decreased to 53.7% from 56.5%, primarily due to an increase in physician compensation, incremental depreciation expense relating to our continued growth and investment in Latin America, facility rent expense from our recent acquisition in Argentina, and expenses from the outsourcing of scans.

The following table presents summaries of results of operations for the years ended December 31, 2009, 2010 and 2011 (dollars in thousands). This information has been derived from the consolidated statements of income and comprehensive income included elsewhere in this Annual Report on Form 10-K.

	Years Ended December 31,					
	2009		2010		2011	
(in thousands):						
Revenues:						
Net patient service revenue	$517,646	98.7%	$ 535,913	98.5%	$ 638,690	99.1%
Other revenue	6,838	1.3	8,050	1.5	6,027	0.9
Total revenues	524,484	100.0	543,963	100.0	644,717	100.0
Salaries and benefits	259,532	49.5	282,302	51.9	326,782	50.7
Medical supplies	45,361	8.6	43,027	7.9	51,838	8.0
Facility rent expenses	22,106	4.2	27,885	5.1	33,375	5.2
Other operating expenses	24,398	4.7	27,103	5.0	33,992	5.3
General and administrative expenses	54,537	10.4	65,798	12.1	81,688	12.7
Depreciation and amortization	46,416	8.8	46,346	8.5	54,084	8.4
Provision for doubtful accounts	12,871	2.5	8,831	1.6	16,117	2.5
Interest expense, net	62,502	11.9	58,505	10.8	60,656	9.4
Loss on sale of assets of a radiation treatment center	—	—	1,903	0.3	—	—
Early extinguishment of debt	—	—	10,947	2.0	—	—
Impairment loss	3,474	0.7	97,916	18.0	360,639	55.9
Loss on investments	—	—	—	—	250	—
Gain on fair value adjustment of previously held equity investment	—	—	—	—	(234)	—
Loss on foreign currency transactions	—	—	—	—	106	—
Loss on forward currency derivative contracts	—	—	—	—	672	0.1
Total expenses	531,197	101.3	670,563	123.2	1,019,965	158.2
Loss before income taxes	(6,713)	(1.3)	(126,600)	(23.2)	(375,248)	(58.2)
Income tax expense (benefit)	1,002	(0.2)	(12,810)	(2.4)	(25,365)	(3.9)
Net loss	(7,715)	(1.5)	(113,790)	(20.8)	(349,883)	(54.3)
Net income attributable to non-controlling interest	(1,835)	(0.3)	(1,698)	(0.3)	(3,558)	(0.6)
Net loss attributable to Radiation Therapy Services Holdings, Inc. shareholder	$ (9,550)	(1.8)%	$(115,488)	(21.1)%	$ (353,441)	(54.9)%

Comparison of the Years Ended December 31, 2010 and 2011

Total revenues. Total revenues increased by $100.7 million, or 18.5%, from $544.0 million in 2010 to $644.7 million in 2011. Total revenue was positively impacted by $98.7 million due to our expansion into new practices and treatments centers in existing local markets and new local markets during 2010 and 2011 through the acquisition of several urology, medical oncology and surgery practices in Florida, Arizona, North and South Carolinas, California and the acquisition of physician radiation practices in South Carolina, West Virginia, California, North Carolina and the acquisition of 30 physician practices in South America, Central America and the Caribbean, the opening of three de novo centers and an

outpatient radiation therapy management services agreement with a medical group to manage its radiation oncology treatment site and two hospital professional services arrangements as follows:

Date	Sites	Location	Market	Type
March 2010	1	El Segundo, California	Los Angeles, California	De Novo
May 2010	1	Pembroke Pines, Florida	Florida—East Coast	De Novo
May 2010	1	Myrtle Beach, South Carolina	South Carolina	Acquisition
December 2010	1	Princeton West Virginia	West Virginia	Acquisition
March 2011	26	South America, Central America and the Caribbean	—	Acquisition
June 2011	1	London, Kentucky	Kentucky	Hospital-based / other groups
August 2011	1	Andalusia, Alabama	Alabama	De Novo
August 2011	1	Redding, California	California	Acquisition
September 2011	2	Broward County—Florida	Florida—East Coast	Hospital-based / other groups
November 2011	4	South America	—	Acquisition
December 2011	2	Goldsboro and Sampson, North Carolina	Eastern, North Carolina	Acquisition

Revenue from CMS for the 2011 PQRI program decreased approximately $2.5 million offset by an increase in our existing local markets and practices by approximately $4.5 million, net of a $1.6 million reduction relating to non-renewal of the capitated contracts in our Las Vegas, Nevada market.

Expenses

Salaries and benefits. Salaries and benefits increased by $44.5 million, or 15.8%, from $282.3 million in 2010 to $326.8 million in 2011. Salaries and benefits as a percentage of total revenues decreased from 51.9% in 2010 to 50.7% in 2011. Additional staffing of personnel and physicians due to our expansion in urology and surgery practices in southwest Florida, Arizona, North and South Carolinas and California, the acquisitions of treatment centers in existing and new local markets during the latter part of 2010 and the expansion into a new region internationally in 2011 contributed $46.8 million to our salaries and benefits. Stock compensation expense included in our salaries and benefits increased $0.4 million as a result of a repurchase of vested units from an executive for use in future reissuance to other executives. For existing practices and centers within our local markets, salaries and benefits decreased $3.6 million, predominately related to our cost reduction program implemented during the third quarter of 2011 offset by additional staffing in our research and development group developing software for our medical equipment of approximately $0.9 million.

Medical supplies. Medical supplies increased by $8.8 million, or 20.5%, from $43.0 million in 2010 to $51.8 million in 2011. Medical supplies as a percentage of total revenues increased from 7.9% in 2010 to 8.0% in 2011. Medical supplies consist of patient positioning devices, radioactive seed supplies, supplies used for other brachytherapy services, pharmaceuticals used in the delivery of radiation therapy treatments and chemotherapy-related and other medical supplies. Approximately $4.9 million of the increase was related to our expansion in urology and surgery practices in southwest Florida, Arizona, North and South Carolinas and California, the acquisitions of treatment centers in existing and new local markets during the latter part of 2010 and the expansion into a new region internationally in 2011. In our remaining practices and centers in existing local markets, medical supplies increased by approximately $3.9 million as we continue to see stable and improving patient volumes and treatment counts in our existing local markets. These pharmaceuticals and chemotherapy medical supplies are principally reimbursable by third-party payers.

Facility rent expenses. Facility rent expenses increased by $5.5 million, or 19.7%, from $27.9 million in 2010 to $33.4 million in 2011. Facility rent expenses as a percentage of total revenues increased from 5.1% in 2010 to 5.2% in 2011. Facility rent expenses consist of rent expense associated with our treatment center locations. Approximately $3.5 million of the increase was related to our

expansion in urology and surgery practices in southwest Florida, Arizona, North and South Carolinas and California, the acquisitions of treatment centers in existing and new local markets during the latter part of 2010 and the expansion into a new region internationally in 2011. On March 31, 2010, the related party lessors completed the refinancing of certain of their respective mortgages to remove the personal guarantees of the debt related thereto. As a result of the refinancing of the landlords' mortgages on these respective properties, we derecognized approximately $64.8 million in real estate subject to finance obligation. As a result of the derecognition, our facility rent expense increased by approximately $2.0 million in 2011.

Other operating expenses. Other operating expenses increased by $6.9 million or 25.4%, from $27.1 million in 2010 to $34.0 million in 2011. Other operating expense as a percentage of total revenues increased from 5.0% in 2010 to 5.3% in 2011. Other operating expenses consist of repairs and maintenance of equipment, equipment rental and contract labor. Approximately $8.7 million of the increase was related to our expansion in urology and surgery practices in southwest Florida, Arizona, North and South Carolinas and California, the acquisitions of treatment centers in existing and new local markets during the latter part of 2010 and the expansion into a new region internationally in 2011, offset by a decrease of approximately $1.8 million in our remaining practices and centers in existing local markets, primarily as a result of a decrease in operating leases on certain of our medical equipment and contract labor for radiation therapists.

General and administrative expenses. General and administrative expenses increased by $15.9 million or 24.1%, from $65.8 million in 2010 to $81.7 million in 2011. General and administrative expenses principally consist of professional service fees, office supplies and expenses, insurance and travel costs. General and administrative expenses as a percentage of total revenues increased from 12.1% in 2010 to 12.7% in 2011. The increase of $15.9 million in general and administrative expenses was due to an increase of approximately $9.6 million relating to our expansion in urology and surgery practices in southwest Florida, Arizona, North and South Carolinas and California, the acquisitions of treatment centers in existing and new local markets during the latter part of 2010 and the expansion into a new region internationally in 2011. An increase of approximately $4.8 million in our remaining practices and treatments centers in our existing local markets, an increase of approximately $1.3 million in diligence costs relating to acquisitions and potential acquisitions of physician practices, an increase in costs of $0.7 million associated with improvements in our income tax provision process offset by a decrease of approximately $0.5 million in litigation settlements with certain physicians.

Depreciation and amortization. Depreciation and amortization increased by $7.7 million, or 16.7%, from $46.3 million in 2010 to $54.1 million in 2011. Depreciation and amortization expense as a percentage of total revenues decreased from 8.5% in 2010 to 8.4% in 2011. The increase of $7.7 million in depreciation and amortization was primarily due to an increase of approximately $4.4 million relating to our expansion in urology and surgery practices in southwest Florida, Arizona, North and South Carolinas and California, the acquisitions of treatment centers in existing and new local markets during the latter part of 2010 and the expansion into a new region internationally in 2011. An increase in capital expenditures related to our investment in advanced radiation treatment technologies in certain local markets increased our depreciation and amortization by approximately $4.3 million, $0.9 million increase due to the amortization of our trade name offset by a decrease of approximately $1.5 million predominately due to the expiration of certain non-compete agreements. On March 31, 2010, we derecognized approximately $64.8 million in real estate subject to finance obligation. As a result of the derecognition, our depreciation and amortization expense decreased by approximately $0.4 million.

Provision for doubtful accounts. The provision for doubtful accounts increased by $7.3 million, or 82.5%, from $8.8 million in 2010 to $16.1 million in 2011. The provision for doubtful accounts as a percentage of total revenues increased from 1.6% in 2010 to 2.5% in 2011. In 2010 we reduced our provision for doubtful accounts as we made efforts to improve the overall collection process, including

a replacement of our claims clearinghouse agent, to provide more efficient and timely claims processing, upgraded certain billing processes, including the electronic transmission of secondary claims and improved processes at the treatment centers to collect co-pay amounts at the time of service. These actions have resulted in improved collections and lower bad debt expense in 2010.

Interest expense, net. Interest expense, increased by $2.2 million, or 3.7%, from $58.5 million in 2010 to $60.7 million in 2011. The increase is primarily attributable to an increase of approximately $7.2 million of interest and fees as a result of the additional senior subordinated notes issued in April 2010 and March 2011 and the additional amortization of deferred financing costs and original issue discount cost of approximately $1.2 million related thereto, and approximately $0.2 million of interest related to international debt, offset by the decrease of approximately $2.1 million in interest expense in 2010 associated with the pro-rata write-off of our deferred financing costs and original issue discount costs resulting from our prepayment of $74.8 million in our Term Loan B in April 2010, the derecognition of approximately $64.8 million in real estate subject to finance obligation on March 31, 2010. As a result of the derecognition, our interest expense relating to the finance obligation decreased by approximately $1.4 million. In addition, our interest rate swap payments decreased by approximately $2.9 million.

Loss on sale of assets of a radiation treatment center. In January 2007, we acquired a 67.5% interest in Gettysburg Radiation, LLC ("GR"), which at that time was in the final stages of developing a free-standing radiation therapy treatment center in Gettysburg, Pennsylvania. Approximately a year later, GR expanded its operations to a second location in Littlestown, Pennsylvania. Due to the poor local economy, as well as the opening of a radiation therapy center by a nearby hospital, the performance of both the Gettysburg and Littlestown facilities deteriorated significantly. During the fourth quarter of 2009, the Littlestown facility was closed. On April 30, 2010, we sold certain assets of the Gettysburg facility to one of GR's minority equity-holders for approximately $925,000 and incurred a loss on the sale of approximately $1.9 million.

Early extinguishment of debt. In 2010 we incurred approximately $10.9 million from the early extinguishment of debt as a result of the prepayment of the $175.0 million in senior subordinated notes, which included the call premium payment of approximately $5.3 million, the write-offs of $2.5 million in deferred financing costs and $3.1 million in original issue discount costs.

Impairment loss. During the third quarter of 2011, we completed an interim impairment test for goodwill and indefinite-lived intangible assets as a result of our review of growth expectations and the release of the final rule issued on the physician fee schedule for 2012 by CMS on November 1, 2011, which included certain rate reductions on Medicare payments to freestanding radiation oncology providers. In performing this test, we assessed the implied fair value of our goodwill and intangible assets. During the third quarter of 2011 we incurred an impairment loss of approximately $237.6 million primarily relating to goodwill and trade name impairment in certain of our reporting units, including North East United States (New York, Rhode Island, Massachusetts and southeast Michigan), California, Southwest U.S. (Arizona and Nevada) , the Florida east coast, Northwest Florida and Southwest Florida of approximately $234.9 million and an impairment loss incurred of approximately $2.7 million in 2011 related to our write-off of our 45% investment interest in a radio-surgery center in Rhode Island due to continued operating losses since its inception in 2008.

During the fourth quarter of 2011, we decided to rebrand our current trade name of 21st Century Oncology. As a result of the rebranding initiative and concurrent with our annual impairment test for goodwill and indefinite-lived intangible assets, we incurred an impairment loss of approximately $121.6 million. Approximately $49.8 million of the $121.6 million related to the trade name impairment as a result of our rebranding initiative. The remaining $71.8 million of impairment related to goodwill in certain of our reporting units, including North East United States, (New York, Rhode Island, Massachusetts and southeast Michigan), and California, Southwest U.S. (Arizona and Nevada). The

remaining domestic U.S. trade name of approximately $4.6 million will be amortized over its remaining useful life through December 31, 2012. We incurred approximately $0.9 million in amortization expense during the fourth quarter. In addition, we impaired certain deposits on equipment of approximately $0.7 million and $0.8 million in leasehold improvements relating to a planned radiation treatment facility office closing in Baltimore, Maryland.

Loss on investments. During the fourth quarter of 2011, we incurred a loss on our 50% investment in an unconsolidated joint venture in a freestanding radiation facility in West Palm Beach Florida. We plan on withdrawing from the joint venture during the first quarter of 2012. As a result, we incurred a loss on our investment of approximately $0.5 million. The loss on our investment in the joint venture was offset by a gain on the sale of an investment in a primary care physician practice of approximately $0.3 million. Proceeds from the sale of the investment was approximately $1.0 million.

Gain on fair value adjustment of previously held equity investment. As result of the acquisition of MDLLC, in which we acquired an effective ownership interest of approximately 91.0% on March 1, 2011, we recorded a gain of approximately $0.2 million to adjust our initial investment in the joint venture to fair value.

Loss on forward currency derivative contracts. We are exposed to a significant amount of foreign exchange risk, primarily between the U.S. dollar and the Argentine peso. This exposure relates to the provision of radiation oncology services to patients at our Latin American operations and purchases of goods and services in foreign currencies. We maintain four forward currency derivative contracts which mature on a quarterly basis. In 2011, the expiration of four forward currency derivative contracts and the mark to market valuation of the remaining contracts resulted in a loss of approximately $0.7 million.

Income taxes. Our effective tax rate was 6.8% in fiscal 2011 and 10.1% in fiscal 2010. The decrease in the benefit reflected in the effective tax rate in the 2011 calendar year is primarily the result of goodwill impairment recognized in the 2011 calendar year which is not deductible for tax purposes, the increase in the valuation allowance against federal and state deferred tax assets and adjustments to deferred income tax items and unrecognized tax positions that were recorded in the 2011 calendar year. The income tax benefit of $25.4 million in 2011 compared to an income tax benefit of $12.8 million in 2010, represents an increase of $12.6 million on an absolute dollar basis.

Our future effective tax rates could be affected by changes in the relative mix of taxable income and taxable loss jurisdictions, changes in the valuation of deferred tax assets or liabilities, or changes in tax laws or interpretations thereof. We monitor the assumptions used in estimating the annual effective tax rate and make adjustments, if required, throughout the year. If actual results differ from the assumptions used in estimating our annual effective tax rates, future income tax expense (benefit) could be materially affected.

In addition, we are periodically under audit by federal, state, or local authorities in the areas of income taxes and other taxes. These audits include questioning the timing and amount of deductions and compliance with federal, state, and local tax laws. We regularly assess the likelihood of adverse outcomes from these audits to determine the adequacy of our provision for income taxes. To the extent we prevail in matters for which accruals have been established or is required to pay amounts in excess of such accruals, the effective tax rate could be materially affected. We are currently undergoing a Federal income tax audit for tax years 2007 through 2008 and New York State audit for tax years 2006 through 2008. Subsequent to the end of the year, we closed the Federal audit for tax years 2005 and 2006, the Alabama audit for tax years 2009 and 2010 and Florida audit for tax years 2007 through 2009.

Net loss. Net loss increased by $236.1 million, from $113.8 million in net loss in 2010 to $349.9 million net loss in 2011 primarily as a result of the impairment loss incurred for the write down of

goodwill, trade name and other investments of approximately $360.6 million. Net loss represents 20.8% of total revenues in 2010 and 54.3% of total revenues in 2011.

Comparison of the Years Ended December 31, 2009 and 2010

Total revenues. Total revenues increased by $19.5 million, or 3.7%, from $524.5 million in 2009 to $544.0 million in 2010. Total revenue was positively impacted by $45.5 million due to our expansion into new practices and treatment centers in existing local markets and new local markets during 2009 and 2010 through the acquisition of several urology, medical oncology and surgery practices in Florida and Arizona, and the acquisition of a physician practice in South Carolina, the opening of nine de novo centers, the transition of one hospital-based arrangement to freestanding and the acquisition of two centers as follows:

Date	Sites	Location	Market	Type
January 2009	1	Hammonton, New Jersey	South New Jersey	De Novo
January 2009	1	Indio, California	Palm Springs, California	De Novo
January 2009	1	Bronx, New York	Westchester/Bronx—New York	Transition to Freestanding
May 2009	1	Fort Myers, Florida	Lee County—Florida	De Novo
June 2009	1	Southbridge, Massachusetts	Central Massachusetts	De Novo
June 2009	1	Gilbert, Arizona	Central Arizona	De Novo
July 2009	1	Providence, Rhode Island	Rhode Island	De Novo
October 2009	1	Yucca Valley, California	Palm Springs, California	De Novo
March 2010	1	El Segundo, California	Los Angeles, California	De Novo
May 2010	1	Pembroke Pines, Florida	Florida East Coast	De Novo
May 2010	1	Myrtle Beach, South Carolina	South Carolina	Acquisition
December 2010	1	Princeton West Virginia	West Virginia	Acquisition

Approximately $6.2 million of the increase was due to recognition of additional reimbursement from CMS. The Tax Relief and Health Care Act of 2006 required the establishment of a physician quality reporting system, including an incentive payment for eligible professionals who satisfactorily report data on quality measures for covered professional services furnished to Medicare beneficiaries. The program under the Medicare system is known as the Physician Quality Reporting Initiative ("PQRI"). We received $3.2 million in payments from CMS for the 2009 claims and data submitted for the PQRI program and expect to receive approximately $3.0 million for the 2010 PQRI program. Offsetting the increases from expansion into new practices and the PQRI program, was a $36.7 million decline in revenue due to decreases in volume and pricing in our existing local markets. The volume decrease was predominantly in certain local markets in Florida, Michigan, Las Vegas and Arizona. The declines in Las Vegas and Arizona were predominately related to certain office consolidations and transitions of new physicians covering these markets that impacted our patient volume. In addition to the PQRI and volume items noted above, during the third quarter of 2009 total revenues were reduced by an increase in contractual allowances of approximately $4.5 million offset by a corresponding decrease in bad debt allowance for the final assessment of our accounts receivable balances within our billing system. In addition, during the current year, we strategically reallocated a number of radiation therapy treatment machines in certain of our local markets in order to meet anticipated demand patterns. During this large scale reorganization, treatment volumes experienced a delay as the machines were being reallocated to new facilities. A portion of the decline in treatment volumes during the current year was due to the machine reallocation, although we continued to experience lower volumes in certain markets as a result of the challenging economic environment.

Salaries and benefits. Salaries and benefits increased by $22.8 million, or 8.8%, from $259.5 million in 2009 to $282.3 million in 2010. Salaries and benefits as a percentage of total revenues increased from 49.5% in 2009 to 51.9% in 2010. The increase of $22.8 million included $7.6 million of physician contracting expenses as result of reassessing certain urology and medical oncology physician groups' compensation arrangements. Additional staffing of personnel and physicians due to our expansion in certain practices in southwest Florida and Arizona and acquisitions of treatment centers in existing local markets during the latter part of 2009 and in 2010 contributed $23.3 million to our increase in salaries and benefits. Salaries and benefits decreased $8.1 million in our existing practices and centers within our local markets. The decrease in our existing local markets was due to the reduction of physician compensation as a result of our revenue declines as well as cost-cutting initiatives implemented during the second half of 2009.

Medical supplies. Medical supplies decreased by $2.4 million, or 5.1%, from $45.4 million in 2009 to $43.0 million in 2010. Medical supplies as a percentage of total revenues decreased from 8.6% in 2009 to 7.9% in 2010. Approximately $4.3 million was related to our expansion into new practices and centers in existing local markets during 2009 and 2010, offset by an approximately $6.7 million decrease in our remaining practices and centers in existing local markets primarily due to cost savings efforts to reduce the per unit costs of medical supplies, including pharmaceuticals used in connection with the delivery of radiation therapy treatments, pharmaceuticals used in urology services, and chemotherapy-related medical supplies as well as a result of the decline in services.

Facility rent expenses. Facility rent expenses increased by $5.8 million, or 26.1%, from $22.1 million in 2009 to $27.9 million in 2010. Facility rent expenses as a percentage of total revenues increased from 4.2% in 2009 to 5.1% in 2010. Facility rent expenses consist of rent expense associated with our treatment center locations. Approximately $3.7 million of the increase was related to our expansion in new practices and centers in existing local markets. On March 31, 2010, the related party lessors completed the refinancing of certain of their respective mortgages to remove the personal guarantees of the debt related thereto. As a result, of the refinancing of the landlords' mortgages on these respective properties we derecognized approximately $64.8 million in real estate subject to finance obligation. As a result of the derecognition, our facility rent expense increased by approximately $2.1 million in 2010 as compared to 2009.

Other operating expenses. Other operating expenses increased by $2.7 million or 11.1%, from $24.4 million in 2009 to $27.1 million in 2010. Other operating expense as a percentage of total revenues increased from 4.7% in 2009 to 5.0% in 2010. Other operating expenses consist of repairs and maintenance of equipment, equipment rental and contract labor. Approximately $2.7 million of the increase was related to our expansion in new practices and centers in existing local markets.

General and administrative expenses. General and administrative expenses increased by $11.3 million or 20.6%, from $54.5 million in 2009 to $65.8 million in 2010. General and administrative expenses principally consist of professional service fees, office supplies and expenses, insurance and travel costs. General and administrative expenses as a percentage of total revenues increased from 10.4% in 2009 to 12.1% in 2010. The increase of $11.3 million in general and administrative expenses was due to an increase of approximately $3.2 million relating to the growth in the number of new practices and treatment centers in our existing local markets, an increase of approximately $2.8 million related to litigation settlements with certain physicians, an increase of approximately $2.9 million in our remaining practices and treatment centers in our existing local markets including professional services relating to our remediation of a material weakness of approximately $0.3 million and an increase of approximately $2.4 million in diligence costs relating to acquisitions of radiation oncology practices in South Carolina, West Virginia and several urology practices and potential acquisitions of physician practices, including diligence costs associated with the MDLLC Acquisition in 2011.

Depreciation and amortization. Depreciation and amortization remained unchanged at $46.4 million in 2009 and 2010. Depreciation and amortization expense as a percentage of total revenues decreased from 8.8% in 2009 to 8.5% in 2010. An increase in capital expenditures related to our investment in advanced radiation treatment technologies in certain local markets increased our depreciation and amortization by approximately $2.4 million, offset by a decrease of approximately $1.6 million predominately due to the expiration of certain non-compete agreements. On March 31, 2010, we derecognized approximately $64.8 million in real estate subject to finance obligation. As a result of the derecognition, our depreciation and amortization expense decreased by approximately $0.8 million.

Provision for doubtful accounts. The provision for doubtful accounts decreased by $4.1 million, or 31.4%, from $12.9 million in 2009 to $8.8 million in 2010. The provision for doubtful accounts as a percentage of total revenues decreased from 2.5% in 2009 to 1.6% in 2010. In the latter part of 2009, we made efforts to improve the overall collection process, including a replacement of our claims clearinghouse agent, to provide more efficient and timely claims processing, upgraded certain billing processes, including the electronic transmission of secondary claims and improved processes at the treatment centers to collect co-pay amounts at the time of service. These actions have resulted in improved collections and lower bad debt expense.

Interest expense, net. Interest expense, net of interest income of approximately $0.6 million, decreased by $4.0 million, or 6.4%, from $62.5 million in 2009 to $58.5 million in 2010. The decrease is primarily attributable to a pay down of approximately $15 million in our senior secured revolving credit facility during the fourth quarter of 2009, along with amortization of our senior secured term loan facility during 2010, principal payments of our capital leases and the refinancing of our debt in April 2010 by replacing the $175.0 million senior subordinated notes due March 2015 at an interest rate of 13.5% with senior subordinated notes due April 2017 at an interest rate of 9.875%. In addition, we incurred an additional $2.1 million in interest expense associated with the pro-rata write-off of our deferred financing costs and original issue discount costs resulting from our prepayment of $74.8 million in our Term Loan B. On March 31, 2010, we derecognized approximately $64.8 million in real estate subject to finance obligation. As a result of the derecognition, our interest expense relating to the finance obligation decreased by approximately $4.3 million.

Loss on sale of assets of a radiation treatment center. In January 2007, we acquired a 67.5% interest in Gettysburg Radiation, LLC (GR), which at that time was in the final stages of developing a free-standing radiation therapy treatment center in Gettysburg, Pennsylvania. Approximately a year later, GR expanded its operations to a second location in Littlestown, Pennsylvania. Due to the poor local economy, as well as the opening of a radiation therapy center by a nearby hospital, the performance of both the Gettysburg and Littlestown facilities deteriorated significantly. During the fourth quarter of 2009, the Littlestown facility was closed. On April 30, 2010, we sold certain assets of the Gettysburg facility to one of GR's minority equity-holders for approximately $925,000 and incurred a loss on the sale of approximately $1.9 million.

Early extinguishment of debt. We incurred approximately $10.9 million from the early extinguishment of debt as a result of the prepayment of the $175.0 million in senior subordinated notes, which included the call premium payment of approximately $5.3 million, write-offs of $2.5 million in deferred financing costs and $3.1 million in original issue discount costs.

Impairment loss. Impairment loss of approximately $3.5 million in 2009 primarily relating to an impairment loss incurred of approximately $1.8 million for the write down to fair value of certain of our linear accelerators and CT machines due to technological obsolescence. The adjustment to machine inventories was due to several considerations, including the planned use of RapidArc technology on 3-D digital machines for which this technology can not be implemented on 2-D digital machines or analog machines. RapidArc radiotherapy technology is an effective cancer treatment representing an

advanced new form of image-guided IMRT. This technology enables clinicians to program a linear accelerator to deliver precise forms of IMRT up to eight times faster than other IMRT systems. It does this by delivering the complete IMRT treatment to the patient in fewer rotations than traditional IMRT. Impairment loss of approximately $97.9 million in 2010 related to our write-off of our investment in a 50% interest in an international freestanding radiation center in Mohali, India of approximately $0.7 million, certain planned office closings in California and Michigan of approximately $3.5 million and goodwill impairment in certain of our reporting units, including California, Southwest U.S. (Arizona and Nevada) and the Florida east coast of approximately $91.2 million and an additional $2.5 million relating to the office closings of certain of our radiation treatment centers.

Income taxes. Our effective tax rate was 10.1% in fiscal 2010 and (14.9%) in fiscal 2009. The increase in the effective tax rate in the 2010 calendar year is primarily the result of goodwill impairment recognized in the 2010 calendar year which is not deductible for tax purposes, the establishment of a valuation allowance against federal and state deferred tax assets and adjustments to deferred income tax items and unrecognized tax positions that were recorded in the 2010 calendar year. The income tax benefit $12.8 million in 2010 compared to an income tax expense of $1.0 million in 2009, represents an increase of $13.8 million on an absolute dollar basis.

The effective tax rate differed from the U.S. federal statutory rate of 35% during 2010 primarily as a result of the effect of the goodwill impairment which is not deductible for tax purposes and the establishment of a valuation allowance against federal deferred tax assets and an increase in the valuation allowance related to state deferred tax assets.

Our future effective tax rates could be affected by changes in the relative mix of taxable income and taxable loss jurisdictions, changes in the valuation of deferred tax assets or liabilities, or changes in tax laws or interpretations thereof. We monitor the assumptions used in estimating the annual effective tax rate and makes adjustments, if required, throughout the year. If actual results differ from the assumptions used in estimating our annual effective tax rates, future income tax expense (benefit) could be materially affected.

In addition, we are periodically under audit by federal, state, or local authorities in the areas of income taxes and other taxes. These audits include questioning the timing and amount of deductions and compliance with federal, state, and local tax laws. We regularly assess the likelihood of adverse outcomes from these audits to determine the adequacy our provision for income taxes. To the extent that we prevail in matters for which accruals have been established or we are required to pay amounts in excess of such accruals, the effective tax rate could be materially affected.

Net loss. Net loss increased by $106.1 million, from $7.7 million in net loss in 2009 to $113.8 million net loss in 2010. Net loss represents 1.5% and 20.8% of total revenues in 2009 and 2010, respectively.

Liquidity and Capital Resources

Our principal capital requirements are for working capital, acquisitions, medical equipment replacement and expansion and de novo treatment center development. Working capital and medical equipment are funded through cash from operations, supplemented, as needed, by five-year fixed rate lease lines of credit. Borrowings under these lease lines of credit are recorded on our balance sheets. The construction of de novo treatment centers is generally funded directly by related party lessors and then leased to us. We finance our operations, capital expenditures and acquisitions through a combination of borrowings and cash generated from operations.

Cash Flows From Operating Activities

Net cash provided by operating activities for the years ended December 31, 2009, 2010 and 2011 was $71.4 million, $49.0 million and $44.8 million, respectively.

Net cash provided by operating activities decreased by $4.2 million from $49.0 million in 2010 to $44.8 million in 2011 predominately due to timing and amount of interest payments. In 2011 we issued an additional $66.25 million in senior subordinated notes due 2017 with interest payments due in April and October of each year. In October 2011, we paid approximately $18.6 million of interest on the $360.0 million in senior subordinated notes due 2017 including interest on the $16.25 million senior subordinated notes due to the seller in the MDLLC transaction. In 2011, we wrote-off approximately $360.6 million in goodwill, trade name, leasehold improvements and other investments as a result of our interim testing of our goodwill and indefinite-lived intangible assets and our rebranding initiatives. We continue to see improvements in our cash collections from our accounts receivable with our days sales outstanding improving from 41 days to 39 days.

Cash at December 31, 2011 held by our foreign subsidiaries was $5.2 million. We consider these cash flows to be permanently invested in our foreign subsidiaries and therefore do not anticipate repatriating any excess cash flows to the U.S. We anticipate we can adequately fund our domestic operations from cash flows generated solely from our U.S. business. Of the $5.2 million of cash held by our foreign subsidiaries at December 31, 2011, $0.4 million is held in U.S. Dollars, $0.1 million of which is held at banks in the United States, with the remaining held in foreign currencies in foreign banks. We believe that the magnitude of our growth opportunities outside of the U.S. will cause us to continuously reinvest foreign earnings. We do not require access to the earnings and cash flow of our international subsidiaries to fund our U.S. operations.

Net cash provided by operating activities decreased by $22.4 million from $71.4 million in 2009 to $49.0 million in 2010. The decrease in cash was predominately due to the refinancing in April 2010, whereby we paid cash from operations, accrued and unpaid interest of approximately $14.9 million on the senior subordinated notes due April 2017 in October 2010. With respect to our prior senior subordinated notes due in 2015 accrued and unpaid interest was paid semi-annually on January 15th and July 15th of each year. In addition, we received approximately $10.8 million in tax refunds in 2009 compared to payments of approximately $0.4 million in 2010. The Company made net tax payments of $.4 million in US and State taxes and $5.4 million in foreign taxes.

Cash Flows From Investing Activities

Net cash used in investing activities for 2009, 2010, and 2011 was $54.2 million, $92.5 million, and $96.8 million, respectively.

Net cash used in investing activities increased by $4.3 million from $92.5 million in 2010 to $96.8 million in 2011. Net cash used in investing activities was impacted by approximately $42.1 million (net of acquired cash of approximately $5.4 million) related to the purchase of the remaining (i) 67% interest in a joint venture that holds a majority equity interest in and manages 25 radiation therapy treatment centers in South America, Central America and the Caribbean (including the purchase of equity units in the underlying operating subsidiaries) and (ii) a 61% interest in a joint venture that operates a treatment center in Guatemala, on March 1, 2011, the purchase of a radiation therapy treatment center and a physician group practice in Northern California for approximately $9.6 million and the purchase of other physician practices of approximately $0.2 million in North Carolina and Florida. In May 2010 we purchased a radiation treatment center and several physician practices in South Carolina for a combined purchase price of approximately $34.5 million. Additional acquisition during the fourth quarter included the purchase of four radiation treatment facilities in Argentina for approximately $6.8 million including cash of approximately $2.1 million and the purchase of two radiation treatment facilities in North Carolina in December, 2011 for approximately $6.3 million.

During 2011, we entered into foreign exchange option contracts expiring at the end of the four consecutive quarterly periods to convert a significant portion of our forecasted foreign currency denominated net income into U.S. dollars to limit the adverse impact of a weakening Argentine peso against the U.S. dollar. The cost of the option contracts, were approximately $1.5 million.

Net cash used in investing activities increased by $38.3 million from $54.2 million in 2009 to $92.5 million in 2010. Net cash used in investing activities was impacted by approximately $10.4 million related to the purchase of (i) a 33% interest in MDLLC, a joint venture that holds a majority equity interest in and manages 26 radiation therapy treatment centers in South America and Central America and (ii) a 19% interest in a joint venture that operates a treatment center in Guatemala, both of which occurred in January 2009. In May 2010 we purchased a radiation treatment center and several physician practices in South Carolina for a combined purchase price of approximately $34.5 million, in cash, and purchased a radiation treatment center in Princeton West Virginia in December 2010 for approximately $8.0 million, in cash. In December 2010, we contributed an initial $1.0 million for a 28.5% interest in a proton beam therapy joint venture with a consortium of five leading New York academic medical centers to be constructed in Manhattan.

Historically, our capital expenditures have been primarily for equipment, leasehold improvements and information technology equipment. Total capital expenditures, inclusive of amounts financed through capital lease arrangements, outstanding accounts payable relating to the acceptance and delivery of medical equipment and exclusive of the purchase of radiation treatment centers, were $37.5 million, $43.8 million and $41.3 million in 2009, 2010 and 2011, respectively. Historically, we have funded our capital expenditures with cash flows from operations, borrowings under our senior secured credit facilities and borrowings under lease lines of credit.

Cash Flows From Financing Activities

Net cash used in financing activities for 2009 was $33.4 million and net cash provided by financing activities for 2010 and 2011 was $24.5 million and $48.2 million, respectively.

In January 2011, we received the Commitment Letter from DDJ Capital Management, LLC to purchase an aggregate principal amount of $50 million of 9⅞% Senior Subordinated Notes due 2017 to be issued by RTS. On March 1, 2011, we issued $50 million of the new notes. The proceeds of $48.5 million were used (i) to fund the MDLLC Acquisition and (ii) to fund transaction costs associated with the MDLLC Acquisition. We incurred approximately $1.6 million in transaction fees and expenses, including legal, accounting and other fees and expenses in connection with the new notes, and an initial purchasers' discount of $0.6 million. On April 1, 2011 we received approximately $6.7 million in capital lease financing from a financial institution to fund previously purchased medical equipment. The terms of the capital lease financing are for five years at an average interest rate of approximately 8%. We also had partnership distributions from non-controlling interests of approximately $3.2 million and $4.4 million in 2010 and 2011, respectively.

On September 29, 2011, we amended our senior secured credit facility. Under the terms of the amendment, the definition of applicable margin was modified, along with financial covenant levels and several modification to the permitted investment baskets and permitted indebtedness. The amendment also extended the revolving credit facility maturity by one year solely for the extended revolving loans, such that they will mature on February 21, 2014, whereas the non-extended revolving loans will continue to mature on February 21, 2013. As a result of the amendment, we paid down approximately $18.0 million in our Revolver loans and incurred approximately $1.3 million in transaction fees and expenses, including legal, accounting and other fees and expenses in connection with the amendment.

On September 30, 2011, we entered into an incremental amendment with a financial institution which agreed to lend an aggregate amount up to $50 million, which will be used for general corporate purposes. As a result of the incremental amendment, we incurred approximately $1.7 million in

transaction fees and expenses, including legal, accounting and other fees and expenses in connection with the incremental amendment.

In November, 2011, we registered approximately $16.25 million in notes and incurred approximately $0.2 million in transaction fees and expenses, including legal, accounting and other fees and expenses.

Net cash provided by financing activities in 2010 included $308.1 million of proceeds received from the issuance of $310.0 million in aggregate principal amount of senior subordinated notes due 2017. The $308.1 million in proceeds was used to repay the existing $175.0 million in senior subordinated notes due 2015, including accrued and unpaid interest and a call premium of approximately $5.3 million. The remaining proceeds from the offering were used to pay down $74.8 million of the senior secured term loan facility and $10.0 million of the senior secured revolving credit facility and to finance the acquisitions of a radiation treatment center and physician practices in South Carolina, which were consummated on May 3, 2010. In addition, we paid approximately $11.9 million of loan costs relating to transaction fees and expenses incurred in connection with the issuance of the $310.0 million senior subordinated notes. We borrowed approximately $8.5 million in December 2010 for the purchase of a radiation treatment center in Princeton West Virginia. Further, we paid approximately $0.9 million in fees and expenses related to our S-4 registration statement filing for the Existing Notes. The change in net cash provided by financing activities included cash provided by non-controlling interest holders in the El Segundo joint venture who contributed approximately $0.6 million in cash for a 22.75% interest in the joint venture. We also had partnership distributions from non-controlling interests of approximately $3.2 million in 2010.

Net cash used in financing activities for 2009 was approximately $33.4 million. Of the cash used in financing, approximately $29.7 million related to principal repayments of debt, including $3.5 million on our senior secured term loan facility, $15.0 million on our senior secured revolving credit facility and approximately $11.2 million for capital lease obligations. In addition we had partnership distributions from non-controlling interests of approximately $2.9 million in 2009.

Senior Secured Credit Facilities and Senior Subordinated Notes

In connection with the 2008 Merger, we entered into our current senior secured credit facilities, which consists of a senior secured term loan facility and a senior secured revolving credit facility. At the Closing, we borrowed $307.0 million under the senior secured term loan facility, utilized $3.1 million of the senior secured revolving credit facility and obtained a $175.0 million senior subordinated interim loan agreement. We incurred expenses of approximately $3.7 million for early extinguishment of debt relating to the termination of certain capital lease obligations, termination of our interest rate swap agreement and the write-off of deferred financing costs relating to the extinguishment of our previous senior secured credit facility. On March 25, 2008, we issued $175.0 million senior subordinated notes due 2015 at an annual interest rate of 13.5%, and repaid the $175.0 million senior subordinated interim loan agreement including any accrued and unpaid interest.

On April 1, 2010, we amended our senior secured credit facility to, among other things, (i) under certain circumstances, allow us to issue permitted additional subordinated debt to fund certain future acquisitions; (ii) disregard, for purposes of calculating compliance with the financial covenants, certain provisions of GAAP that would require us to treat leased properties as owned by us; and (iii) provide for certain other modifications to permit the incurrence of additional indebtedness in connection with certain future acquisitions and the ability to make additional investments, subject to pro forma compliance with certain performance-based incurrence covenants, and other restrictions.

On April 20, 2010, we consummated a debt offering ("Offering") in an aggregate principal amount of $310.0 million of 9⅞% senior subordinated notes due 2017, and repaid our existing $175.0 million in aggregate principal amount 13.5% senior subordinated notes due 2015, including accrued and unpaid interest of approximately $6.4 million and the call premium of approximately $5.3 million. The remaining proceeds from the Offering were used to pay down $74.8 million of the Term Loan B and $10.0 million of the Revolver. A portion of the proceeds of the Offering was placed in a restricted account pending application to finance certain acquisitions, including the acquisitions of a radiation treatment center and physician practices in South Carolina, which were consummated on May 3, 2010. We incurred approximately $11.9 million in transaction fees and expenses, including legal, accounting and other fees and expenses in connection with the Offering, including the initial purchasers' discount of $1.9 million.

We incurred approximately $10.9 million in early extinguishment of debt as a result of the prepayment of the $175.0 million in senior subordinated notes, which included the call premium payment of approximately $5.3 million, the write-offs of $2.5 million in deferred financing costs and $3.1 million in original issue discount costs.

On April 22, 2010, affiliates of certain of the initial purchasers of the $310.0 million in aggregate principal amount 9⅞% senior subordinated notes due 2017, as lenders under our senior secured revolving credit facility, provided an additional $15.0 million of commitments to the revolving credit portion of our senior secured credit facility increasing the available commitment from $60.0 million to $75.0 million. We paid $2.0 million to Vestar Capital Partners V, L.P. for additional transaction advisory services in respect to the incremental amendments to our existing senior secured revolving credit facility, the additional $15.0 million of commitments to the revolver portion, and the complete refinancing of the senior subordinated notes.

On May 3, 2010, we entered into Amendment No. 3 to our senior secured credit facilities, dated February 21, 2008 (as amended by Amendment No. 1, dated August 15, 2008, Amendment No. 2, dated April 1, 2010, Incremental Amendments dated April 22, 2010, Amendment No. 3, dated May 3, 2010, and as otherwise amended from time to time, the "Credit Agreement"), by and among the Company, RTS, the subsidiaries of RTS identified therein as the guarantors, the institutions from time to time party thereto as lenders, Wells Fargo Bank, N.A. (as successor to Wachovia Bank, National Association), in its capacity as administrative agent for the lenders thereto and the other agents and arrangers named therein, pursuant to which we revised certain administrative matters, including to permit us to provide to the lenders thereunder the consolidated financial statements of Parent, in lieu of those of the borrower, RTS.

Our senior secured credit facilities:

- is secured by a pledge of substantially all our tangible and intangible assets, including accounts receivable, inventory and capital stock of its existing and future subsidiaries, and requires that borrowings and other amounts due under it will be guaranteed by its existing and future subsidiaries;
- requires us to make mandatory prepayments of outstanding borrowings, with a corresponding reduction in the maximum amount of borrowings available under the senior secured credit facility, with net proceeds from insurance recoveries and asset sales, and with the net proceeds from the issuance of equity or debt securities, subject to specified exceptions;
- includes a number of restrictive covenants including, among other things, limitations on leverage, capital and acquisitions expenditures, and requirements that we maintain minimum ratios of cash flow to interest;
- limits our ability to pay dividends on its capital stock; and

• contains customary events of default, including an event of default upon a change in control.

The senior secured credit facility requires that we comply with certain financial covenants, including:

	Requirement	Level at December 31, 2011
Maximum permitted consolidated leverage ratio . .	<6.00 to 1.00	5.27 to 1.00
Minimum permitted consolidated interest coverage ratio	>2.00 to 1.00	2.29 to 1.00

The maximum permitted consolidated leverage ratio required is <6.00 to 1.00 from July 1, 2011 through December 31, 2011, <5.75 to 1.00 from January 1, 2012 to June 30, 2012, <5.50 to 1.00 from July 1, 2012 to June 30, 2013 and <5.25 to 1.00 thereafter.

The minimum permitted consolidated interest coverage ratio required is >2.00 to 1.00 through June 30, 2012, >2.05 to 1.00 from July 1, 2012 through December 31, 2012, >2.10 to 1.00 from January 1, 2013 to June 30, 2013 and >2.20 to 1.00 thereafter.

The senior secured credit facility also requires that we comply with various other covenants, including, but not limited to, restrictions on new indebtedness, asset sales, capital expenditures, acquisitions and dividends, with which we were in compliance as of December 31, 2011.

In January 2011, we received the Commitment Letter from DDJ Capital Management, LLC to purchase an aggregate principal amount of $50 million of 9⅞% Senior Subordinated Notes due 2017 to be issued by RTS. On March 1, 2011, we issued $50 million of the New Notes. The proceeds of $48.5 million were used (i) to fund the MDLLC Acquisition and (ii) to fund transaction costs associated with the MDLLC Acquisition. We incurred approximately $1.6 million in transaction fees and expenses, including legal, accounting and other fees and expenses in connection with the new notes, and an initial purchasers' discount of $0.6 million.

On April 1, 2011, we received approximately $6.7 million in capital lease financing from a financial institution to fund previously purchased medical equipment. The terms of the capital lease financing are for five years at an average interest rate of approximately 8%.

In August 2011, we entered into a lease line of credit with a financial institution for the purpose of obtaining financing for medical equipment purchases in the commitment amount of $12.5 million. The commitment, subject to various restrictions, is scheduled to be available through November 2011. As of December 31, 2011 we had utilized approximately $8.7 million under the lease line of credit.

On September 29, 2011, we amended our senior secured credit facility. Under the terms of the amendment, the definition of Applicable Margin was modified to increase the rate on both the senior secured term loan and extended revolving loans under the revolving credit facility provided for under the senior secured credit facility by 50 basis points. Both the senior secured term loan and amounts borrowed under the revolving credit facility will now bear interest based (i) with respect to extended revolving loans and the senior secured term loans, on either (A) LIBOR plus a spread of 475 basis points, or (B) the ABR plus a spread of 375 basis points, and (ii) with respect to non-extended revolving loans, on either (A) LIBOR plus a spread of 425 basis points, or (B) the ABR plus a spread of 325 basis points, in each case depending on whether the Company elects Eurodollar loans or ABR loans, respectively. The amendment also extended the revolving credit facility maturity by one year solely for the extended revolving loans, such that they will mature on February 21, 2014, whereas the non-extended revolving loans will continue to mature on February 21, 2013.

The amendment modified the financial covenant levels, including to modify (x) the total leverage ratio to 6.00 to 1.00 for the Company's fiscal quarters ending September 30, 2011 and December 31,

2011, decreasing thereafter as specified therein, and (y) the consolidated interest coverage ratio to 2.00 to 1.00 for the Company's fiscal quarters ending March 31, 2011 through June 30, 2012 and increasing thereafter as specified therein.

The amendment also made several modifications to the permitted investments baskets, the permitted indebtedness baskets and several definitions in the senior secured credit facility.

On September 30, 2011, we entered into an incremental amendment (the "Incremental Amendment") with Wells Fargo Bank, National Association, in its capacity as administrative agent for the lenders and SunTrust Bank, as incremental lender. The Incremental Amendment amends the senior secured credit facility. Under the terms of the Incremental Amendment, SunTrust Bank agreed to lend an aggregate amount up to $50 million, which will be used for general corporate purposes.

We believe available borrowings under our senior secured credit facilities, together with our cash flows from operations, will be sufficient to fund our currently anticipated operating requirements. To the extent available borrowings and cash flows from operations are insufficient to fund future requirements, we may be required to seek additional financing through additional increases in our senior secured credit facilities, negotiate additional credit facilities with other lenders or institutions or seek additional capital through private placements or public offerings of equity or debt securities. No assurances can be given that we will be able to extend or increase our senior secured credit facilities, secure additional bank borrowings or lease line of credit or complete additional debt or equity financings on terms favorable to us or at all. Our ability to meet our funding needs could be adversely affected if we experience a decline in our results of operations, or if we violate the covenants and other restrictions to which we are subject under our senior secured credit facilities.

Finance Obligation

We lease certain of our treatment centers (each, a "facility" and, collectively, the "facilities") and other properties from partnerships that are majority-owned by related parties (each, a "related party lessor" and, collectively, the "related party lessors"). See "Certain Relationships and Related Party Transactions." The related party lessors construct the facilities in accordance with our plans and specifications and subsequently lease these facilities to us. Due to the related party relationship, we are considered the owner of these facilities during the construction period pursuant to the provisions of Accounting Standards Codification ("ASC") 840-40, "Sale-Leaseback Transactions" ("ASC 840-40"). In accordance with ASC 840-40, we record a construction in progress asset for these facilities with a corresponding finance obligation during the construction period. These related parties guarantee the debt of the related party lessors, which is considered to be "continuing involvement" pursuant to ASC 840-40. Accordingly, these leases did not qualify as a normal sale-leaseback at the time that construction was completed and these facilities were leased to us. As a result, the costs to construct the facilities and the related finance obligation are recorded on our consolidated balance sheets after construction was completed. The construction costs are included in "Real Estate Subject to Finance Obligation" in the condensed consolidated balance sheets and the accompanying notes, included in this Annual Report on Form 10-K. The finance obligation is amortized over the lease during the construction period term based on the payments designated in the lease agreements.

As of March 31, 2010, the related party lessors completed the refinancing of certain of their respective mortgages to remove the personal guarantees of the debt related thereto. As a result, we derecognized approximately $64.8 million in real estate subject to finance obligation, $67.7 million in finance obligation and recorded approximately $2.9 million of deferred gains that will be amortized as a reduction of rent expense over 15 years. In addition, we entered into a new master lease arrangement with the landlord on 28 properties. The initial term of the master lease is 15 years with four 5 year renewal options. Annual payments, including executory costs, total approximately $13.4 million pursuant to the master lease. The lease payments are scheduled to increase annually based on increases in the

consumer price index. During 2011 the related party lessors completed construction of 2 properties. Upon completion we entered into a new master lease arrangement with the related party lessors for these 2 properties as well as an existing property. The initial term of the new master lease arrangement is 15 years with four 5 year renewal options. Annual payments, including executory costs, total approximately $0.7 million pursuant to the master lease. The lease payments are scheduled to increase annually based on increases in the consumer price index. The amount of finance obligations related to properties that have not been derecognized as well as one property under development as of December 31, 2011 and December 31, 2010 was $14.3 million and $8.6 million, respectively.

Billing and Collections

Our billing system in the U.S. utilizes a fee schedule for billing patients, third-party payers and government sponsored programs, including Medicare and Medicaid. Fees billed to government sponsored programs, including Medicare and Medicaid, and fees billed to contracted payers and self pay patients (not covered under other third party payer arrangements) are automatically adjusted to the allowable payment amount at time of billing. In 2009, we updated our billing system to include fee schedules on approximately 85% of all payers and developed a blended rate allowable amount on the remaining payers. As a result of this change in 2009, fees billed to all payers are automatically adjusted to the allowable payment at time of billing.

Insurance information is requested from all patients either at the time the first appointment is scheduled or at the time of service. A copy of the insurance card is scanned into our system at the time of service so that it is readily available to staff during the collection process. Patient demographic information is collected for both our clinical and billing systems.

It is our policy to collect co-payments from the patient at the time of service. Insurance benefit information is obtained and the patient is informed of their deductible and co-payment responsibility prior to the commencement of treatment.

Charges are posted to the billing system by coders in our offices or in our central billing office. After charges are posted, edits are performed, any necessary corrections are made and billing forms are generated, then sent electronically to our clearinghouse whenever electronic submission is possible. Any bills not able to be processed through the clearinghouse are printed and mailed from our print mail service. Statements are automatically generated from our billing system and mailed to the patient on a regular basis for any amounts still outstanding from the patient. Daily, weekly and monthly accounts receivable analysis reports are utilized by staff and management to prioritize accounts for collection purposes, as well as to identify trends and issues. Strategies to respond proactively to these issues are developed at weekly and monthly team meetings. Our write-off process is manual and our process for collecting accounts receivable is dependent on the type of payer as set forth below.

Medicare, Medicaid and Commercial Payer Balances

Our central billing office staff expedites the payment process from insurance companies and other payers via electronic inquiries, phone calls and automated letters to ensure timely payment. Our billing system generates standard aging reports by date of billing in increments of 30 day intervals. The collection team utilizes these reports to assess and determine the payers requiring additional focus and collection efforts. Our accounts receivable exposure on Medicare, Medicaid and commercial payer balances are largely limited to denials and other unusual adjustments. Our exposure to bad debts on balances relating to these types of payers over the years has been insignificant.

In the event of denial of payment, we follow the payer's standard appeals process, both to secure payment and to lobby the payers, as appropriate, to modify their medical policies to expand coverage for the newer and more advanced treatment services that we provide which, in many cases, is the payer's reason for denial of payment. If all reasonable collection efforts with these payers have been exhausted by our central billing office staff, the account receivable is written-off.

Self-Pay Balances

We administer self-pay account balances through our central billing office and our policy is to first attempt to collect these balances although after initial attempts we often send outstanding self-pay patient claims to collection agencies at designated points in the collection process. In some cases monthly payment arrangements are made with patients for the account balance remaining after insurance payments have been applied. These accounts are reviewed monthly to ensure payments continue to be made in a timely manner. Once it has been determined by our staff that the patient is not responding to our collection attempts, a final notice is mailed. This generally occurs more than 120 days after the date of the original bill. If there is no response to our final notice, after 30 days the account is assigned to a collection agency and, as appropriate, recorded as a bad debt and written off. We also have payment arrangements with patients for the self-pay portion due in which monthly payments are made by the patient on a predetermined schedule. Balances under $50 are written off but not sent to the collection agency. All accounts are specifically identified for write-offs and accounts are written off prior to being submitted to the collection agency.

Acquisitions and Developments

The following table summarizes our growth in treatment centers and the local markets in which we operate for the periods indicated:

	Year Ended December 31,		
	2009	2010	2011
Treatment centers at beginning of period	97	97	95
Internally developed	7	2	1
Transitioned to freestanding	1	—	—
Internally (consolidated/closed/sold)	(5)	(5)	(5)
Acquired	—	2	33
Hospital-based/other groups	—	(1)	3
Hospital-based (ended/transitioned)	(3)	—	—
Treatment centers at period end	97	95	127
Number of regions at period end	8	8	9
Number of local markets at period end	28	28	28

In 2009, we internally developed seven new radiation centers, transitioned a hospital based arrangement to a freestanding radiation center, consolidated five radiation centers, ended two hospital-based arrangements and acquired the assets of several physician practices as follows:

In January 2009, we purchased a 33% interest in MDLLC, a joint venture affiliated with the brother and father of Dr. Dosoretz, our Chief Executive Officer, President and a director on the Company's board of directors, that holds a majority equity interest in, and manages, 26 radiation therapy treatment centers through 16 legal entities in South America, Central America and the Caribbean (which translates into us owning a 19% indirect ownership interest in the underlying radiation therapy treatment centers), and a 19% interest in a joint venture that operates a treatment

center in Guatemala for an aggregate of approximately $10.4 million, subject to final determination of the purchase price based on a multiple of historical earnings before interest, taxes and depreciation and amortization. In January 2010, we finalized the amount due for our 33% interest in the joint venture and paid an additional $1.9 million. The transaction was accounted for under the equity method. We also had a four-year call option to purchase the remaining 67% in the MDLLC joint venture in which we purchased a 33% interest, which would result in an ownership interest of approximately 90% in the underlying radiation oncology business located in South America, Central America and the Caribbean, at a price based on a multiple of historical earnings before interest, taxes and depreciation and amortization. See "Certain Relationships and Related Party Transactions."

In January 2009, we opened our Hammonton, New Jersey and Indio, California treatment centers and began treating patients at the facilities and converted a hospital based arrangement to a freestanding facility in Bronx-Lebanon, New York.

In May 2009, we opened a cancer center in Lee County, Florida.

In June 2009, we opened two additional radiation treatment centers, one in Southbridge, Massachusetts and another treatment center in Gilbert, Arizona.

In July 2009, we opened a radiation treatment center in Providence, Rhode Island in partnership with a hospital to provide stereotactic radio-surgery through the use of a cyberknife. We own approximately 45% of the joint venture.

In October 2009, we opened our Yucca Valley, California treatment center.

During 2009, we acquired the assets of several physician practices in Florida for approximately $0.2 million. The physician practices provide synergistic clinical services to our patients in the respective markets in which we treat.

During the fourth quarter of 2009, we closed five offices including two centers in Florida, one in Pennsylvania, one in Arizona and one in Nevada. We closed these offices to consolidate the number of offices within the market in order to leverage adjacent centers and/or due to excess capacity. The patients treated at these offices will be treated within the same market at other existing radiation treatment centers.

In 2009, we terminated two professional service agreements, one in Florida in January 2009 and one in New Jersey in June 2009.

In 2010, we internally developed two new radiation centers, sold one radiation center, closed four radiation centers, acquired two radiation centers, consolidated a hospital-based radiation center and acquired the assets of several physician practices as follows:

In March 2010, we contributed approximately $3.0 million in tangible assets for a 77.3% interest in a joint venture with a group of physicians to open a radiation treatment center in El Segundo, California. The radiation treatment center expands our presence into the California market.

On April 30, 2010, we sold certain assets of the Gettysburg facility to one of Gettysburg Radiation, LLC's minority equityholders for approximately $925,000. Due to the poor local economy, as well as the opening of a radiation therapy center by a nearby hospital, the performance of the Gettysburg facility deteriorated significantly.

In April 2010, we entered into definitive agreements with Carolina Regional Cancer Center, P.A. for the acquisition of a radiation treatment center in Myrtle Beach, South Carolina that holds three certificate of need licenses, and Atlantic Urology Clinics, LLC, Adult & Pediatric Urology Center of the Carolina, P.A., Coastal Urology Center, P.A. and Grand Strand Urology, LLP with respect to the acquisition of the assets of these Myrtle Beach-based physician practices. On May 3, 2010, we consummated these acquisitions for a combined purchase price of approximately $34.5 million in cash.

The acquisition of the Myrtle Beach facility expands our presence into a new local market within an existing regional division.

In May 2010, we opened our Pembroke Pines, Florida treatment center.

During the fourth quarter of 2010, we closed and consolidated two radiation centers in Michigan and two radiation centers in Nevada and consolidated a hospital-based radiation center in Utica, New York.

In December 2010, we acquired the assets of a radiation treatment center located in Princeton, West Virginia for approximately $8.0 million. The center purchased in West Virginia further expands our presence into the West Virginia market.

During 2010, we acquired the assets of several physician practices in Florida and Arizona for approximately $860,000. The physician practices provide synergistic clinical services to our patients in the respective markets in which we treat.

On March 1, 2011, we purchased the remaining 67% interest in MDLLC from Bernardo Dosoretz as well as interests in the subsidiaries of MDLLC from Alejandro Dosoretz and Bernardo Dosoretz, resulting in an ownership interest of approximately 91% in the underlying radiation oncology practices located in South America, Central America and the Caribbean. The Company also purchased an additional 61% interest in Clinica de Radioterapia La Asuncion S.A. from Bernardo Dosoretz, resulting in an ownership interest of 80%. The Company consummated these acquisitions for a combined purchase price of approximately $82.7 million, comprised of $47.5 million in cash, 25 common units of Parent immediately exchanged for 13,660 units of RT Investments' non-voting preferred equity units and 258,955 units of RT Investments' class A equity units totaling approximately $16.25 million, and issuance of a 9⅞% note payable, due 2017 totaling approximately $16.05 million to the seller and an estimated contingent earn out payment totaling $2.3 million, and issuance of real estate located in Costa Rica totaling $0.6 million. The earn out payment is contingent upon certain acquired centers attaining earnings before interest, taxes, depreciation and amortization targets, is due 18 months subsequent to the transaction closing, and is payable through Company financing and issuance of equity units.

In June 2011, we entered into an outpatient radiation therapy management services agreement with a medical group to manage its radiation oncology treatment site in London, Kentucky.

In July 2011, we entered into a revised facility management services agreement with an existing provider in Michigan. The provider will become a subsidiary of a larger medical practice group, in which we will continue the management of the radiation oncology practices in Michigan. This arrangement became effective during the fourth quarter of 2011.

In August 2011 we completed a replacement de novo radiation treatment facility in Alabama. This facility replaces an existing radiation treatment facility in which we are now providing consult services.

On August 29, 2011, we acquired the assets of a radiation treatment center located in Redding, California, for approximately $9.6 Million. The acquisition of the Redding facility further expands our presence into the Northern California market.

In September 2011, we entered into a professional services agreement with a hospital district in Broward County, Florida to provide professional services at two sites within the hospital district.

On November 4, 2011, the Company purchased an 80% interest in an operating entity, which operates 1 radiation treatment center in Argentina; an 80% interest in another operating entity, which operates 3 radiation treatment centers in Argentina; and a 96% interest in an operating entity, which operates 1 radiation treatment center in Argentina. The combined purchase price of the ownership interests totals approximately $7.4 million, comprised of $2.1 million in cash, seller financing totaling

approximately $4.0 million payable over 24 monthly installments, commencing January 2012, and a purchase option totaling approximately $1.3 million. The acquisition of these operating treatment centers expands the Company's presence in its international markets.

On December 22, 2011, the Company acquired the interest in an operating entity which operates two radiation treatment centers in located in North Carolina, for approximately $6.3 Million, including an earn-out provision of approximately $0.4 million contingent upon maintaining a certain level of patient volume. The acquisition of the two radiation treatment centers further expands the Company's presence into the eastern North Carolina market.

During 2011, the Company acquired the assets of several physician practices in Florida and the non-professional practice assets of several North Carolina physician practices for approximately $0.4 million. The physician practices provide synergistic clinical services to our patients in the respective markets in which we treat.

The operations of the foregoing acquisitions have been included in the accompanying consolidated statements of comprehensive loss from the respective dates of each acquisition. When we acquire a treatment center, the purchase price is allocated to the assets acquired and liabilities assumed based upon their respective fair values.

During the first quarter of 2011, we closed two treatment facilities in California, one in Beverly Hills and the other facility in Corona. In addition we are no longer treating at our Gilbert Arizona facility and we are using the center for our other specialty practices for office visits and consults.

In July 2011, we closed a radiation treatment facility in Las Vegas, Nevada.

As of December 31, 2011, we have one replacement de novo radiation treatment center project in process in Michigan and four additional de novo radiation treatment centers located in New York, Bolivia and two in Argentina. The internal development of radiation treatment centers is subject to a number of risks including but not limited to risks related to negotiating and finalizing agreements, construction delays, unexpected costs, obtaining required regulatory permits, licenses and approvals and the availability of qualified healthcare and administrative professionals and personnel. As such, we cannot assure you that we will be able to successfully develop radiation treatment centers in accordance with our current plans and any failure or material delay in successfully completing planned internally developed treatment centers could harm our business and impair our future growth.

We have been selected by a consortium of leading New York academic medical centers (including Memorial Sloan Kettering Cancer Center, Beth Israel Medical Center/Continuum Health System, NYU Langone Medical Center, Mt. Sinai Medical Center, and Montefiore Medical Center) to serve as the developer and manager of a proton beam therapy center to be constructed in Manhattan. The project is in the final stages of certificate of need approval. We expect to invest approximately $10,000,000 in the project and will have an approximate 28.5% ownership interest. We will also receive a management fee of 5% of collected revenues. In connection with our role as manager, we have accounted for our interest in the center as an equity method investment. The center is expected to commence operations in mid-2014.

Critical Accounting Policies

Our discussion and analysis of our financial condition and results of operations are based upon our consolidated financial statements, which have been prepared in accordance with accounting principles generally accepted in the United States. The preparation of these financial statements requires us to make estimates and judgments that affect the reported amounts of assets, liabilities, revenues and expenses, and related disclosures of contingent assets and liabilities. We continuously evaluate our critical accounting policies and estimates. We base our estimates on historical experience and on various assumptions that we believe to be reasonable under the circumstances, the results of which

form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. Actual results may differ materially from these estimates under different assumptions or conditions.

We believe the following critical accounting policies are important to the portrayal of our financial condition and results of operations and require our management's subjective or complex judgment because of the sensitivity of the methods, assumptions and estimates used in the preparation of our consolidated financial statements.

Variable Interest Entities

We evaluate certain of our radiation oncology practices in order to determine if they are variable interest entities ("VIE"). This evaluation resulted in determining that certain of our radiation oncology practices were potential variable interests. For each of these practices, we have determined (1) the sufficiency of the fair value of the entities' equity investments at risk to absorb losses, (2) that, as a group, the holders of the equity investments at risk have (a) the direct or indirect ability through voting rights to make decisions about the entities' significant activities, (b) the obligation to absorb the expected losses of the entity and their obligations are not protected directly or indirectly, and (c) the right to receive the expected residual return of the entity, and (3) substantially all of the entities' activities do not involve or are not conducted on behalf of an investor that has disproportionately fewer voting rights in terms of its obligation to absorb the expected losses or its right to receive expected residual returns of the entity, or both. ASC 810, "Consolidation" ("ASC 810"), requires a company to consolidate VIEs if the company is the primary beneficiary of the activities of those entities. Certain of our radiation oncology practices are variable interest entities and we have a variable interest in certain of these practices through our administrative services agreements. Pursuant to ASC 810, through our variable interests in these practices, we have the power to direct the activities of these practices that most significantly impact the entity's economic performance and we would absorb a majority of the expected losses of these practices should they occur. Based on these determinations, we have included these radiation oncology practices in our consolidated financial statements for all periods presented. All significant intercompany accounts and transactions have been eliminated.

We adopted updated accounting guidance beginning with the first quarter of 2010, by providing an ongoing qualitative rather than quantitative assessment of our ability to direct the activities of a variable interest entity that most significantly impact the entity's economic performance and our rights or obligations to receive benefits or absorb losses, in order to determine whether those entities will be required to be consolidated in our consolidated financial statements. The adoption of the new guidance had no material impact to our financial position and results of operations.

Net Patient Service Revenue and Allowances for Contractual Discounts

We have agreements with third-party payers that provide us payments at amounts different from our established rates. Net patient service revenue is reported at the estimated net realizable amounts due from patients, third-party payers and others for services rendered. Net patient service revenue is recognized as services are provided. Medicare and other governmental programs reimburse physicians based on fee schedules, which are determined by the related government agency. We also have agreements with managed care organizations to provide physician services based on negotiated fee schedules. Accordingly, the revenues reported in our consolidated financial statements are recorded at the amount that is expected to be received.

We derive a significant portion of our revenues from Medicare, Medicaid and other payers that receive discounts from our standard charges. We must estimate the total amount of these discounts to prepare our consolidated financial statements. The Medicare and Medicaid regulations and various managed care contracts under which these discounts must be calculated are complex and subject to

interpretation and adjustment. We estimate the allowance for contractual discounts on a payer class basis given our interpretation of the applicable regulations or contract terms. These interpretations sometimes result in payments that differ from our estimates. Additionally, updated regulations and contract renegotiations occur frequently necessitating regular review and assessment of the estimation process. Changes in estimates related to the allowance for contractual discounts affect revenues reported in our consolidated statements of operations and comprehensive (loss) income. If our overall estimated allowance for contractual discounts on our revenues for the year ended December 31, 2011 were changed by 1%, our after-tax loss from continuing operations would change by approximately $0.1 million. This is only one example of reasonably possible sensitivity scenarios. A significant increase in our estimate of contractual discounts for all payers would lower our earnings. This would adversely affect our results of operations, financial condition, liquidity and future access to capital.

During the years ended 2009, 2010 and 2011, approximately 44%, 48% and 48%, respectively, of net patient service revenue related to services rendered under the Medicare and Medicaid programs. In the ordinary course of business, we are potentially subject to a review by regulatory agencies concerning the accuracy of billings and sufficiency of supporting documentation of procedures performed. Laws and regulations governing the Medicare and Medicaid programs are extremely complex and subject to interpretation. As a result, there is at least a reasonable possibility that estimates will change by a material amount in the near term.

Accounts Receivable and Allowances for Doubtful Accounts

Accounts receivable are reported net of estimated allowances for doubtful accounts and contractual adjustments. Accounts receivable are uncollateralized and primarily consist of amounts due from third-party payers and patients. To provide for accounts receivable that could become uncollectible in the future, we establish an allowance for doubtful accounts to reduce the carrying amount of such receivables to their estimated net realizable value. The credit risk for other concentrations (other than Medicare) of receivables is limited due to the large number of insurance companies and other payers that provide payments for our services. We do not believe that there are any other significant concentrations of receivables from any particular payer that would subject us to any significant credit risk in the collection of our accounts receivable.

The amount of the provision for doubtful accounts is based upon our assessment of historical and expected net collections, business and economic conditions, trends in Federal and state governmental healthcare coverage and other collection indicators. The primary tool used in our assessment is an annual, detailed review of historical collections and write-offs of accounts receivable as they relate to aged accounts receivable balances. The results of our detailed review of historical collections and write-offs, adjusted for changes in trends and conditions, are used to evaluate the allowance amount for the current period. If the actual bad debt allowance percentage applied to the applicable aging categories would change by 1% from our estimated bad debt allowance percentage for the year ended December 31, 2011, our after-tax loss from continuing operations would change by approximately $0.7 million and our net accounts receivable would change by approximately $1.1 million at December 31, 2011. The resulting change in this analytical tool is considered to be a reasonably likely change that would affect our overall assessment of this critical accounting estimate. Accounts receivable are written-off after collection efforts have been followed in accordance with our policies.

Goodwill and Other Intangible Assets

Goodwill represents the excess purchase price over the estimated fair value of net assets acquired by the Company in business combinations. Goodwill and indefinite life intangible assets are not amortized but are reviewed annually for impairment, or more frequently if impairment indicators arise. Goodwill impairment was recognized for the year ended December 31, 2010 of approximately $91.2 million as a result of our annual review performed during the fourth quarter of 2010 and an

additional $2.5 million for certain radiation treatment office closings. During the third quarter of 2011 we recognized goodwill impairment of approximately $226.5 million and trade name impairment of approximately $8.4 million as a result of our review of growth expectations and the release of the final rule issued on the physician fee schedule for 2012 by CMS on November 1, 2011, which included certain rate reductions on Medicare payments to freestanding radiation oncology providers. During the fourth quarter of 2011 we incurred an impairment loss of approximately $121.6 million. Approximately $49.8 million of the $121.6 million related to the trade name impairment as a result of our rebranding initiative. The remaining $71.8 million of impairment relating to goodwill in certain of our reporting units. No goodwill impairment loss was recognized for the year ended December 31, 2009.

The implied fair value of goodwill is determined in the same manner as the amount of goodwill recognized in a business combination. The estimated fair value of the reporting unit is allocated to all of the assets and liabilities of the reporting unit (including the unrecognized intangible assets) as if the reporting unit had been acquired in a business combination and the estimated fair value of the reporting unit was the purchase price paid. Based on (i) assessment of current and expected future economic conditions, (ii) trends, strategies and forecasted cash flows at each reporting unit and (iii) assumptions similar to those that market participants would make in valuing the reporting units.

The estimated fair value measurements were developed using significant unobservable inputs (Level 3). For goodwill, the primary valuation technique used was an income methodology based on estimates of forecasted cash flows for each reporting unit, with those cash flows discounted to present value using rates commensurate with the risks of those cash flows. In addition, a market- based valuation method involving analysis of market multiples of revenues and earnings before interest, taxes, depreciation and amortization ("EBITDA") for (i) a group of comparable public companies and (ii) recent transactions, if any, involving comparable companies. Assumptions used are similar to those that would be used by market participants performing valuations of regional divisions. Assumptions were based on analysis of current and expected future economic conditions and the strategic plan for each reporting unit.

Intangible assets consist of trade names, non-compete agreements, licenses and hospital contractual relationships. Trade names have an indefinite life and are tested annually for impairment. Non-compete agreements, licenses and hospital contractual relationships are amortized over the life of the agreement (which typically ranges from 2 to 20 years) using the straight-line method. No intangible asset impairment loss was recognized for any period presented.

During the second quarter of 2011, certain of our regions' patient volume have stabilized in their respective markets. Although we have had a stabilization of patient volume, we reviewed our anticipated growth expectations in certain of our reporting units and are considering adjusting our expectations for the remainder of the year. If our previously projected cash flows for these reporting units are not achieved, it may be necessary to revise these estimated cash flows and obtain a valuation analysis and appraisal that will enable us to determine if all or a portion of the recorded goodwill or any portion of other long-lived assets are impaired.

During the third quarter of 2011, we completed an interim impairment test for goodwill and indefinite-lived intangible assets. In performing this test, we assessed the implied fair value of our goodwill and intangible assets. We determined that the carrying value of goodwill and trade name in certain U.S. Domestic markets, including North East United States (New York, Rhode Island, Massachusetts and southeast Michigan), California, South West United States (central Arizona and Las Vegas, Nevada), the Florida east coast, Northwest Florida and Southwest Florida regions exceeded their fair value. Accordingly, we recorded noncash impairment charges in the U.S. Domestic reporting segment totaling $234.9 million relating to goodwill and trade name in the consolidated statements of operations for the quarter ended September 30, 2011.

During the fourth quarter of 2011, we decided to rebrand our current trade name of 21st Century Oncology. As a result of the rebranding initiative and concurrent with our annual impairment test for goodwill and indefinite-lived intangible assets, we incurred an impairment loss of approximately $121.6 million. Approximately $49.8 million of the $121.6 million related to the trade name impairment as a result of our rebranding initiative. The remaining $71.8 million of impairment relating to goodwill in certain of our reporting units, including North East United States, (New York, Rhode Island, Massachusetts and southeast Michigan), and California, Southwest U.S. (Arizona and Nevada). The remaining domestic U.S. trade name of approximately $4.6 million will be amortized over its remaining useful life through December 31, 2012. We incurred approximately $0.9 million in amortization expense during the fourth quarter. In addition, we impaired certain deposits on equipment of approximately $0.7 million and $0.8 million in leasehold improvements relating to a planned radiation treatment facility office closing in Baltimore, Maryland.

Impairment of Long-Lived Assets

In accordance with ASC 360, "Accounting for the Impairment or Disposal of Long-Lived Assets", we review our long-lived assets for impairment whenever events or changes in circumstances indicate that the carrying amount of these assets may not be fully recoverable. Assessment of possible impairment of a particular asset is based on our ability to recover the carrying value of such asset based on our estimate of its undiscounted future cash flows. If these estimated future cash flows are less than the carrying value of such asset, an impairment charge would be recognized for the amount by which the asset's carrying value exceeds its estimated fair value.

Stock-Based Compensation

All share-based compensation cost is measured at the grant date, based on the fair value of the award, and is recognized as an expense in the statement of operations and comprehensive loss over the requisite service period.

For purposes of determining the compensation expense associated with equity grants, we value the business enterprise using a variety of widely accepted valuation techniques, which considered a number of factors such as the financial performance of the Company, the values of comparable companies and the lack of marketability of the Company's equity. The Company then uses the option pricing method to determine the fair value of equity units at the time of grant using the following assumptions: a term of five years, which is based on the expected term in which the units will be realized; a risk-free interest rate of 1.96% and 0.53% for grants issued in 2010 and 2011, respectively, which is the five-year U.S. federal treasury bond rate consistent with the term assumption; and expected volatility of 50% and 55% for grants issued in 2010 and 2011, respectively, which is based on the historical data of equity instruments of comparable companies.

The estimated fair value of the units, less an assumed forfeiture rate of 2.7%, is recognized in expense in the Company's financial statements on a straight-line basis over the requisite service periods of the awards for Class B Units. For Class B Units, the requisite service period is 48 months, and for Class C Units, the requisite service period is 34 months only if probable of being met. The assumed forfeiture rate is based on an average historical forfeiture rate.

Income Taxes

We make estimates in recording our provision for income taxes, including determination of deferred tax assets and deferred tax liabilities and any valuation allowances that might be required against the deferred tax assets. ASC 740, "Income Taxes" ("ASC 740") requires that a valuation allowance be established when it is more likely than not that all or a portion of a deferred tax asset will not be realized. In 2009, we determined that a valuation allowance of $3.4 million was appropriate

under the provisions of ASC 740. This valuation allowance of $3.4 million was against state deferred tax assets. Primarily because of the current year taxable loss as of December 31, 2010, the Company determined that the valuation allowance should be $17.6 million, consisting of $12.3 million against federal deferred tax assets and $5.3 million against state deferred tax assets. This represents an increase of $14.2 million in valuation allowance. Additional valuation allowance of $27.9 million has been recorded in 2011 consisting of $26.0 million against federal deferred tax assets and $1.9 million against state deferred tax assets.

ASC 740 clarifies the accounting for uncertainty in income taxes recognized in an entity's financial statements and prescribes a recognition threshold and measurement attributes for financial statement disclosure of tax positions taken or expected to be taken on a tax return. Under ASC 740, the impact of an uncertain tax position on the income tax return must be recognized at the largest amount that is more-likely-than-not to be sustained upon audit by the relevant taxing authority. An uncertain income tax position will not be recognized if it has less than a 50% likelihood of being sustained. Additionally, ASC 740 provides guidance on derecognition, classification, interest and penalties, accounting in interim periods, disclosure, and transition.

We are subject to taxation in the United States, approximately 22 state jurisdictions and throughout Latin America, namely, Argentina, Bolivia, Costa Rica, Dominican Republic, El Salvador, Guatemala and Mexico. However, the principal jurisdictions for which we are subject to tax are the United States, Florida and Argentina.

Our future effective tax rates could be affected by changes in the relative mix of taxable income and taxable loss jurisdictions, changes in the valuation of deferred tax assets or liabilities, or changes in tax laws, interpretations thereof. We monitor the assumptions used in estimating the annual effective tax rate and makes adjustments, if required, throughout the year. If actual results differ from the assumptions used in estimating our annual effective tax rates, future income tax expense (benefit) could be materially affected.

In addition, we are routinely under audit by federal, state, or local authorities in the areas of income taxes and other taxes. These audits include questioning the timing and amount of deductions and compliance with federal, state, and local tax laws. We regularly assess the likelihood of adverse outcomes from these audits to determine the adequacy of our provision for income taxes. To the extent we prevail in matters for which accruals have been established or is required to pay amounts in excess of such accruals, the effective tax rate could be materially affected. We are currently undergoing a Federal income tax audit for tax years 2007 through 2008 and New York State audit for tax years 2006 through 2008. Subsequent to the end of the year, we closed the Federal audit for tax years 2005 and 2006, the Alabama audit for tax years 2009 and 2010 and Florida audit for tax years 2007 through 2009.

New Pronouncements

In August 2010, the FASB issued ASU 2010-23, "Health Care Entities (Topic 954): Measuring Charity Care for Disclosure" ("ASU 2010-23"), which amends ASC 954 to require that cost be used as the measurement basis for charity care disclosure purposes and that cost be identified as the direct and indirect costs of providing the charity care. We have historically measured charity care services by identifying the foregone patients charges associated with the provision of those services. We adopted ASU 2010-23 on January 1, 2011. The cost of charity care services is measured by developing a ratio of costs as compared to gross charges and applying the resulting ratio against gross charges associated with charity care patient services.

In August 2010, the FASB issued ASU 2010-24, "Health Care Entities (Topic 954): Presentation of Insurance Claims and Related Insurance Recoveries" ("ASU 2010-24"), which amends ASC 954 to clarify that a health care entity cannot net insurance recoveries against a related claim liability. Additionally, ASU 2010-24 notes the amount of the claim liability should be determined without

consideration of insurance recoveries. ASU 2010-24 is effective for us on January 1, 2011. As a result, on January 1, 2011, we recorded current claims liabilities totaling $2.2 million in other current liabilities; non-current claims liabilities totaling $2.3 million in other non-current liabilities; current claims insurance recoveries totaling $2.2 million in other current assets; and non-current claims insurance recoveries totaling $2.3 million in other non-current assets. The adoption of ASU 2010-24 did not have any impact to the consolidated statement of comprehensive loss and was not applied retrospectively to December 31, 2010.

In May 2011, the FASB issued ASU 2011-04, *Fair Value Measurement (Topic 820): Amendments to Achieve Common Fair Value Measurement and Disclosure Requirements in U.S. GAAP and International Financial Reporting Standards*,(ASU 2011-04), which amends the *FASB Accounting Standards Codification* to provide a consistent definition of fair value and ensure that the fair value measurement and disclosure requirements are similar between U.S. GAAP and International Financial Reporting Standards. ASU 2011-04 changes certain fair value measurement principles and enhances the disclosure requirements particularly for level 3 fair value measurements. ASU 2011-04 is applied prospectively. The amendments are effective for fiscal years, and interim period within those years, beginning after December 15, 2011, and as such we will adopt ASU 2011-04 on January 1, 2012. We are currently evaluating the impact of our pending adoption of ASU 2011-04 on our consolidated financial statements and accompanying notes.

In June 2011, the FASB issued ASU 2011-05, *Comprehensive Income (Topic 220): Presentation of Comprehensive Income*, (ASU 2011-05). ASU 2011-05 amends the *FASB Accounting Standards Codification* to allow an entity the option to present the total of comprehensive income, the components of net income, and the components of other comprehensive income either in a single continuous statement of comprehensive income or in two separate but consecutive statements. In both choices, an entity is required to present each component of net income along with the total net income, each component of other comprehensive income along with a total for other comprehensive income, and a total amount for comprehensive income. ASU 2011-05 eliminates the option to present the components of other comprehensive income as part of the statement of changes in stockholders' equity. The amendments to the Codification in the ASU do not change the items that must be reported in other comprehensive income or when an item of other comprehensive income must be reclassified to net income. ASU 2011-05 should be applied retrospectively. The amendments are effective for fiscal years, and interim period within those years, beginning after December 15, 2011. We adopted ASU 2011-05 in 2011.

In July 2011, the FASB issued ASU 2011-07, *Health Care Entities (Topic 954): Presentation and Disclosure of Patient Service Revenue, Provision for Bad Debts, and the Allowance for Doubtful Accounts for Certain Health Care Entities,* (ASU 2011-07). ASU 2011-07 amends the *FASB Accounting Standards Codification* to require health care entities that recognize significant amounts of patient service revenue at the time services are rendered even though they do not assess the patient's ability to pay to present the provision for bad debts related to patient service revenue as a deduction from patient service revenue (net of contractual allowances and discounts) on their statement of operations. Additionally, those health care entities are required to provide enhanced disclosure about their policies for recognizing revenue and assessing bad debts. The amendments also require disclosures of patient service revenue (net of contractual allowances and discounts) as well as qualitative and quantitative information about changes in the allowance for doubtful accounts. ASU 2011-07 is applied retrospectively and disclosures relating to ASU 2011-07 are applied prospectively. The amendments are effective for fiscal years, and interim period within those years, beginning after December 15, 2011. We are currently evaluating the impact of ASU 2011-07 on our consolidated financial statements.

Reimbursement, Legislative And Regulatory Changes

Legislative and regulatory action has resulted in continuing changes in reimbursement under the Medicare and Medicaid programs that will continue to limit payments we receive under these programs.

Within the statutory framework of the Medicare and Medicaid programs, there are substantial areas subject to legislative and regulatory changes, administrative rulings, interpretations, and discretion which may further affect payments made under those programs, and the federal and state governments may, in the future, reduce the funds available under those programs or require more stringent utilization and quality reviews of our treatment centers or require other changes in our operations. Additionally, there may be a continued rise in managed care programs and future restructuring of the financing and delivery of healthcare in the United States. These events could have an adverse effect on our future financial results.

Inflation

While inflation was not a material factor in either revenue or operating expenses during the periods presented, the healthcare industry is labor- intensive. Wages and other expenses increase during periods of inflation and labor shortages, such as the nationwide shortage of dosimetrists and radiation therapists. In addition, suppliers pass along rising costs to us in the form of higher prices. We have implemented cost control measures to curb increases in operating costs and expenses. We have to date offset increases in operating costs by increasing reimbursement or expanding services. However, we cannot predict our ability to cover, or offset, future cost increases.

Commitments

The following table sets forth our contractual obligations as of December 31, 2011.

	Payments Due by Period				
Contractual Cash Obligations	Total	Less Than 1 Year	2 - 3 Years	4 - 5 Years	After 5 Years
			(in thousands)		
Senior secured credit facilities(1)	$ 307,503	$ 15,448	$292,055	$ —	$ —
Senior subordinated notes(2)	580,600	37,155	74,309	74,309	394,827
Other notes and capital leases(3)	34,305	15,786	12,869	5,535	115
Operating lease obligations(4)	381,930	34,392	63,054	57,510	226,974
Finance obligations(5)	18,053	1,264	2,837	2,888	11,064
Total contractual cash obligations	$1,322,391	$104,045	$445,124	$140,242	$632,980

(1) As of December 31, 2011, there was $265.4 million aggregate principal amount outstanding under our senior secured term loan facility (excluding original issue discount of $1.0 million) and $10.0 million in aggregate principal amount outstanding under our senior secured revolving credit facility (excluding issued but undrawn letters of credit). Interest expense and fees on our senior secured term loan facility is based on an assumed interest rate of the three-month LIBOR rate as of December 31, 2011 plus 475 basis points plus unused commitment fees on our $112.1 million senior secured revolving credit facility.

(2) Senior subordinated notes of $376.3 million (excluding original issue discount of $2.2 million), with a 7 year maturity. Interest expense is based on an interest rate of 9⅞%.

(3) Other notes and capital leases includes leases relating to medical equipment.

(4) Operating lease obligations includes land and buildings, and equipment.

(5) Finance obligations includes real estate under the failed sale-leaseback accounting. See "Management's Discussion and Analysis of Financial Condition and Results of Operations—Results of Operations—Finance Obligation."

Off-Balance Sheet Arrangements

We do not currently have any off-balance sheet arrangements with unconsolidated entities or financial partnerships, such as entities often referred to as structured finance or special purpose entities, which would have been established for the purpose of facilitating off-balance sheet arrangements or other contractually narrow or limited purposes. In addition, we do not engage in trading activities involving non-exchange traded contracts. As such, we are not materially exposed to any financing, liquidity, market or credit risk that could arise if we had engaged in these relationships.

Item 7A. ***Quantitative and Qualitative Disclosures About Market Risk***

Interest Rate Sensitivity

We are exposed to various market risks as a part of our operations, and we anticipate that this exposure will increase as a result of our planned growth. In an effort to mitigate losses associated with these risks, we may at times enter into derivative financial instruments. These derivative financial instruments may take the form of forward sales contracts, option contracts, and interest rate swaps. We have not and do not intend to engage in the practice of trading derivative securities for profit. Because our borrowings under our senior secured credit facilities will bear interest at variable rates, we are sensitive to changes in prevailing interest rates. We currently manage part of our interest rate risk under an interest rate swap agreement.

Interest Rate Swap

We are exposed to changes in interest rates as a result of our outstanding variable rate debt. To reduce the interest rate exposure, we entered into an interest rate swap agreement whereby we fixed the interest rate on the notional amount of approximately $290.6 million of our senior secured term loan facility, effective as of June 30, 2008. The rate and maturity of the interest rate swap is 3.67% plus a margin, which is currently 425 basis points, and expires on March 31, 2012. The amount of our senior secured term loan facility subject to the interest rate swap agreement will reduce from $290.6 million to $116.0 million by the end of the term. In December 2011, we terminated the interest rate swap agreement and paid approximately $1.9 million representing the fair value of the interest rate hedge at time of termination. At December 31, 2011 no amount of the floating rate senior debt was subject to an interest rate swap. At December 31, 2010, the amount of the floating rate senior debt subject to the interest rate swap was $174.2 million.

In July 2011, we entered into two interest rate swap agreements whereby we fixed the interest rate on the notional amounts totaling approximately $116.0 million of our senior secured term loan facility, effective as of March 30, 2012. The rate and maturity of the interest rate swap agreements are 0.923% plus a margin, which is currently 475 basis points, and expires on December 31, 2013.

The swaps are derivatives and are accounted for under ASC 815, "Derivatives and Hedging" ("ASC 815"). The fair value of the swap agreements, representing the estimated amount that we would pay to a third party assuming our obligations under the interest rate swap agreements terminated at December 31, 2011 and December 31, 2010, was approximately $0.7 million and $5.0 million, respectively. The estimated fair value of our interest rate swaps were determined using the income approach that considers various inputs and assumptions, including LIBOR swap rates, cash flow activity, yield curves and other relevant economic measures, all of which are observable market inputs that are classified under Level 2 of the fair value hierarchy. The fair value also incorporates valuation adjustments for credit risk.

Since we have the ability to elect different interest rates on the debt at each reset date, and our senior secured credit facility contains certain prepayment provisions, the hedging relationship does not qualify for use of the shortcut method under ASC 815. Therefore, the effectiveness of the hedge relationships are assessed on a quarterly basis during the life of the hedge through regression analysis. The entire change in fair market value is recorded in equity, net of tax, as other comprehensive income (loss).

Interest Rates

Outstanding balances under our senior secured credit facility bear interest based on either LIBOR plus an initial spread, or an alternate base rate plus an initial spread, at our option. Accordingly, an adverse change in interest rates would cause an increase in the amount of interest paid. As of December 31, 2011, we have interest rate exposure on $275.4 million of our senior secured credit facility. A 100 basis point change in interest rates on our senior secured credit facility would result in an increase of $2.8 million in the amount of annualized interest paid and annualized interest expense recognized in our consolidated financial statements.

Foreign Currency Derivative Contracts

Foreign currency risk is the risk that fluctuations in foreign exchange rates could impact our results of operations. We are exposed to a significant amount of foreign exchange risk, primarily between the U.S. dollar and the Argentine peso. This exposure relates to the provision of radiation oncology services to patients at our Latin American operations and purchases of goods and services in foreign currencies. On March 18, 2011, we entered into foreign exchange option contracts expiring at the end of the four consecutive quarterly periods beginning April 1, 2011 to convert a significant portion of our forecasted foreign currency denominated net income into U.S. dollars to limit the adverse impact of a weakening Argentine peso against the U.S. dollar. On December 21, 2011, we entered into a foreign exchange option contract maturing on December 28, 2012 to replace the contract maturing on December 30, 2011. Because our Argentine forecasted foreign currency denominated net income is expected to increase commensurate with inflationary expectations, the adverse impact on net income from a weakening Argentine peso against the U.S. dollar is limited to the cost of the option contracts, which was approximately $1.2 million. With respect to a strengthening Argentine peso against the U.S. dollar versus inflationary expectations, the estimated favorable impact on net income for an Argentine peso that is 5%, 10% and 15% stronger than inflationary expectations, will be $(0.2) million, $0.3 million and $1.0 million to our consolidated results, respectively, which includes the cost of the option contracts. Under our foreign currency management program, we expect to monitor foreign exchange rates and periodically enter into forward contracts and other derivative instruments. Currently, we are targeting to cover approximately 70% of our forecasted Latin American operating income over the next twelve months through the use of forward contracts and other derivatives with the actual percentage determined by management based on the changing exchange rate environment. We do not use derivative financial instruments for speculative purposes.

These programs reduce, but do not entirely eliminate, the impact of currency exchange movements. Foreign currency forward and option contracts are sensitive to changes in foreign currency exchange rates. Our current practice is to use currency derivatives without hedge accounting designation. The maturity of these instruments generally occurs within twelve months. Gains or losses resulting from the fair valuing of these instruments are reported in loss on forward currency derivative contracts on the consolidated statements of comprehensive loss. For the year ended December 31, 2011 we incurred a loss of approximately $672,000 relating to the fair market valuation of our foreign currency derivative program.

Item 8. *Financial Statements and Supplementary Data*

Information with respect to this Item is contained in our consolidated financial statements beginning with the Index on Page F-1 of this report, which is incorporated herein by reference.

Item 9. *Changes in and Disagreements with Accountants on Accounting and Financial Disclosure*

None.

Item 9A. *Controls and Procedures*

(10)(a) Evaluation of Disclosure Controls and Procedures

We maintain disclosure controls and procedures to ensure that information required to be disclosed in reports filed or submitted under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the rules and forms of the SEC, and is accumulated and communicated to management, including the President and Chief Executive Officer and the Chief Financial Officer, to allow for timely decisions regarding required disclosure. There are inherent limitations to the effectiveness of any system of disclosure controls and procedures, including the possibility of human error and the circumvention or overriding of the controls and procedures. As of December 31, 2011, the end of the period covered by this Annual Report on Form 10-K, our management, with the participation of our principal executive officers and principal financial officer, has evaluated the effectiveness of our disclosure controls and procedures as defined in Rules 13a-15(e) and 15d-15(e) of the Exchange Act. Based on that evaluation, our principal executive officers and principal financial officer concluded that our disclosure controls and procedures were effective as of December 31, 2011.

REPORT OF MANAGEMENT ON INTERNAL CONTROL OVER FINANCIAL REPORTING

The management of Radiation Therapy Services Holdings, Inc. (the "Company") is responsible for the preparation, integrity and fair presentation of the consolidated financial statements appearing in our periodic filings with the Securities and Exchange Commission. The consolidated financial statements were prepared in conformity with United States generally accepted accounting principles appropriate in the circumstances and, accordingly, include certain amounts based on our best judgments and estimates.

Management is also responsible for establishing and maintaining adequate internal control over financial reporting as such term is defined in Rules 13a-15(f) under the Securities Exchange Act of 1934. Internal control over financial reporting is a process to provide reasonable assurance regarding the reliability of our financial reporting in accordance with accounting principles generally accepted in the United States of America. Our internal control over financial reporting includes a program of internal audits and appropriate reviews by management, written policies and guidelines, careful selection and training of qualified personnel including a dedicated Compliance department and a written Code of Business Conduct and Ethics adopted by our Board of Directors, applicable to all of our directors, officers and employees.

Internal control over financial reporting includes maintaining records that in reasonable detail accurately and fairly reflect our transactions; providing reasonable assurance that transactions are recorded as necessary for preparation of our financial statements; providing reasonable assurance that receipts and expenditures of company assets are made in accordance with management authorization; and providing reasonable assurance that unauthorized acquisition, use or disposition of company assets that could have a material effect on our financial statements would be prevented or detected in a timely manner. Because of its inherent limitations, including the possibility of human error and the circumvention or overriding of control procedures, internal control over financial reporting is not intended to provide absolute assurance that a misstatement of our financial statements would be prevented or detected. Therefore, even those internal controls determined to be effective can provide only reasonable assurance with respect to financial statement preparation and presentation.

Management conducted an evaluation of the effectiveness of our internal control over financial reporting based on the framework in *Internal Control—Integrated Framework* issued by the Committee of Sponsoring Organizations of the Treadway Commission. Management's evaluation did not include an assessment of the effectiveness of internal control over financial reporting for Medical Developers, LLC, which the Company acquired effective March 1, 2011. Medical Developers, LLC represented approximately $136 million of the Company's consolidated total assets as of December 31, 2011 and approximately $60 million of the Company's consolidated total revenues during the year ended December 31, 2011. Based on this evaluation, management concluded that the Company's internal control over financial reporting, excluding the internal controls of Medical Developers, LLC, was effective as of December 31, 2011.

This annual report does not include an attestation report of our independent registered public accounting firm regarding internal control over financial reporting. Management's report was not subject to attestation by our independent registered public accounting firm pursuant to an exemption for issuers that are not "large accelerated filers" nor "accelerated filers" set forth in Section 989G(a) set forth in the *Dodd-Frank Wall Street Reform and Consumer Protection Act* enacted into federal law in July 2010.

Changes in Internal Control Over Financial Reporting

We completed the acquisition of Medical Developers, LLC ("MDLLC"), effective March 1, 2011. The facilities acquired as part of the MDLLC acquisition utilize different information technology systems from our other facilities. We are currently integrating our internal control processes at

MDLLC. We have excluded all of the MDLLC operations from our assessment of and conclusion on the effectiveness of our internal control over financial reporting. There has been no change in our internal control over financial reporting during the year ended December 31, 2011 that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting. Management's report on internal control over financial reporting is included above.

Item 9B: ***Other Information***

None

PART III

Item 10. *Directors, Executive Officers and Corporate Governance*

Radiation Therapy Services Holdings, Inc.'s Executive Officers, Directors and Key Employees

Our executive officers, directors and key employees and their ages and position are as follows:

Name	Age	Position
Daniel E. Dosoretz, M.D.	59	Chief Executive Officer and Director
Bryan J. Carey	51	Chief Financial Officer and Director
Joseph Biscardi	43	Controller and Chief Accounting Officer
James L. Elrod, Jr.	57	President and Director
Anil Shrivastava	43	Director
Erin L. Russell	37	Vice President and Director
James H. Rubenstein, M.D.	57	Director
Howard M. Sheridan, M.D.	67	Director

Daniel E. Dosoretz, M.D., F.A.C.R., F.A.C.R.O. is one of our founders and has served as a director since 1988 and as its President and Chief Executive Officer since April 1997. Dr. Dosoretz is also employed as a physician by our wholly-owned subsidiary, 21st Century Oncology, LLC. Prior to founding the Company, Dr. Dosoretz served as attending physician at the Massachusetts General Hospital. He also was an Instructor and Assistant Professor of Radiation Medicine at Harvard Medical School and Research Fellow of the American Cancer Society. Upon moving to Fort Myers, Florida, he was appointed to the Clinical Faculty as Associate Professor at the University of Miami School of Medicine. He also has been a visiting Professor at Duke University Medical School and is a Distinguished Alumni Visiting Professor in Radiation Oncology at Massachusetts General Hospital, Harvard Medical School. Dr. Dosoretz is board certified in Therapeutic Radiology by the American Board of Radiology. He is a Fellow of ACRO and of the American College of Radiology and is a member of the International Stereotactic Radiosurgery Society, the American Society for Therapeutic Radiology and Oncology and the American Society of Clinical Oncology. Dr. Dosoretz graduated from the University of Buenos Aires School of Medicine with the Gold medal for being top of his class, and served his residency in Radiation Oncology at the Department of Radiation Medicine at the Massachusetts General Hospital, Harvard Medical School, where he was selected Chief Resident of the department. Dr. Dosoretz's role as founder, President and Chief Executive Officer of the Company, history with the Company and significant operating experience in the health care industry and extensive board experience led to the conclusion that Dr. Dosoretz should serve as a director of the Company.

Bryan J. Carey has been a member of our board of directors since April 2009 and our Chief Financial Officer since January 2012. He was previously our interim Chief Financial Officer from September 2009 to March 2010 and May 2011 to December 2011. Mr. Carey is a Managing Director of Vestar, primarily focused on Healthcare investments. He joined Vestar in 2000, having been Executive Vice President, Chief Financial Officer and Managing Director of the European operations of Aearo Corporation, a Vestar portfolio company. Mr. Carey is currently a director and member of the audit committee of Sunrise Medical, Inc. Mr. Carey was a director of Joerns Healthcare, LLC until August 2010. He received his A.B. in economics from Georgetown University and his M.B.A. from the Wharton School of the University of Pennsylvania. Mr. Carey's experience in the health care industry and collective board experience, experience as the Company's interim Chief Financial Officer and background including his personal involvement in the healthcare field led to the conclusion that Mr. Carey should serve as a director of the Company.

Joseph Biscardi has served as the Company's Controller and Chief Accounting Officer since February 2008. Prior to joining us, Mr. Biscardi worked for PricewaterhouseCoopers, LLP from 1993 to 1997. Mr. Biscardi holds a B.B.A. in accounting from Hofstra University. He is a Certified Public

Accountant in New York and a member of the American Institute of Certified Public Accountants, a member of the Healthcare Financial Management Association and a member of the Financial Executives International.

James L. Elrod, Jr. has been served as President of the Company and as a member of the Company's board of directors since February 2008. Mr. Elrod is a Managing Director of Vestar and is currently the Co-Head of its Global Healthcare Group. Prior to joining Vestar in 1998, Mr. Elrod was Executive Vice President, Finance and Operations for Physicians Health Service, a public managed care company. Prior to that, he was a Managing Director and Partner of Dillon, Read & Co. Inc. Mr. Elrod is currently a director of National Mentor Holdings, Inc. and was a director of Joerns Healthcare, LLC until August 2010 and of Essent Healthcare until November 2011. Mr. Elrod received his A.B. from Colgate University and his M.B.A. from Harvard Business School. Mr. Elrod's experience in the health care industry and collective board experience, financial experience, and diverse personal background led to the conclusion that Mr. Elrod should serve as a director of the Company.

Anil Shrivastava has been a member of the Company's board of directors since February 2008. Mr. Shrivastava is a Managing Director of Vestar, primarily focused on Healthcare investments. Mr. Shrivastava joined Vestar in 2007. Previously, he was a partner at Bain & Company, Inc., the global consulting firm, as a leader in their healthcare practice. Mr. Shrivastava is currently a director of MediMedia USA, LLC, Sunrise Medical, Inc. and DeVilbiss Healthcare, LLC. Mr. Shrivastava received his B.A. from Harvard University and his M.B.A. from Harvard Business School. Mr. Shrivastava's experience in the health care industry and collective board experience, financial experience, and diverse personal background led to the conclusion that Mr. Shrivastava should serve as a director of the Company.

Erin L. Russell has served as a Vice President of the Company and as a member of the Company's board of directors since February 2008. Ms. Russell is a Principal of Vestar, and is primarily focused on Healthcare investments. Ms. Russell joined Vestar in 2000. Previously, she was a member of the mergers and acquisitions group at PaineWebber, Inc. Ms. Russell is currently a director and a member of the audit committee of DynaVox Inc. In addition, she serves on the National Advisory Board of the Jefferson Scholars Foundation at the University of Virginia. Ms. Russell received a B.S. from the McIntire School of Commerce at the University of Virginia and her M.B.A. from Harvard Business School. Ms. Russell's experience in the health care industry board experience and diverse personal background led to the conclusion that Ms. Russell should serve as a director of the Company.

James H. Rubenstein, M.D. has served as a director of the Company since February 2008. Dr. Rubenstein is also employed as a physician by our wholly-owned subsidiary, 21st Century Oncology, LLC. Prior to joining us, Dr. Rubenstein was an Assistant Professor of Radiation Oncology at the University of Pennsylvania and later became Co-Director of its Radiation Oncology Residency Program. He also served as Chairman of the Department of Medicine for Columbia Regional Medical Center in Southwest Florida and became a Clinical Assistant Professor at the University of Miami School of Medicine's Department of Radiology. He is board certified in Internal Medicine by the American Board of Internal Medicine and in Radiation Oncology by the American Board of Radiology. He graduated from New York University School of Medicine and completed his internship and residency in internal medicine at Beth Israel Hospital in Boston, at the same time working as an Assistant Instructor in internal medicine for Harvard University's School of Medicine. Dr. Rubenstein's years of experience in the health care industry career, particularly in radiation oncology and with the Company, as well as his familiarity with all aspects of its business led to the conclusion that Dr. Rubenstein should serve as a director of the Company.

Howard M. Sheridan, M.D. has served as a director of the Company since February 2008. Dr. Sheridan planned and developed our first radiation treatment center. Prior to joining us, Dr. Sheridan served as President of the medical staff at Southwest Florida Regional Medical Center as

well as chairman of the Department of Radiology. Dr. Sheridan currently serves as Chairman of Edison Bancshares, Inc. He previously served on the Advisory Board of Southeast Bank, N.A., and also served as a founding Director and member of the Executive Compensation and Loan Committee of Heritage National Bank from 1989 until September 1996, when Heritage was acquired by SouthTrust Corporation. Dr. Sheridan has practiced interventional radiology and diagnostic radiology in Fort Myers, Florida from 1975 until accepting the chairmanship in April 2004. Dr. Sheridan is a member of the American Medical Association, the Florida Medical Association, and the American College of Radiology. Dr. Sheridan is the Vice President of 21st Century C.A.R.E., a non-profit dedicated to cancer patient assistance, research and education. Dr. Sheridan is also on the Dean's Counsel of Tulane Medical School. He graduated from Tulane Medical School and completed his residency at the University of Colorado Medical Center. Dr. Sheridan is board certified by the American Board of Radiology and the American Board of Nuclear Medicine. Dr. Sheridan's board experience, years of experience in the health care industry career, particularly in radiation oncology and with the Company, as well as his familiarity with all aspects of its business since its founding led to the conclusion that Dr. Sheridan should serve as a director of the Company.

Radiation Therapy Services, Inc.'s Executive Officers, Directors and Key Employees

The business and operations of the Company are managed through RTS, our wholly owned operating subsidiary, which is the parent of our provider subsidiaries. As such, the information set forth below and in the remaining sections of this Item 10 are presented with respect to RTS.

RTS's executive officers, directors and key employees and their ages and position are as follows:

Name	Age	Position
Daniel E. Dosoretz, M.D.	59	President, Chief Executive Officer and Director
Bryan J. Carey	51	Vice Chairman and Chief Financial Officer
Joseph M. Garcia	42	Chief Operating Officer
Eduardo Fernandez, M.D., Ph.D	48	Senior Vice President, Physician Management
Constantine A. Mantz, M.D.	43	Chief Medical Officer
Norton L. Travis	58	Executive Vice President and General Counsel
Madlyn Dornaus	59	Senior Vice President, Chief Compliance Officer
Joseph Biscardi	43	Vice President, Assistant Treasurer, Controller and Chief Accounting Officer
J. Dennis Humble	52	Treasurer
Daniel H. Galmarini	56	Chief Technology Officer
Kurt L. Janavitz	44	Senior Vice President of Managed Care and Network Development
Anil Shrivastava	43	Director
Erin L. Russell	37	Director
James H. Rubenstein, M.D.	57	Secretary, Medical Director and Director
Howard M. Sheridan, M.D.	67	Director

Daniel E. Dosoretz, M.D., F.A.C.R., F.A.C.R.O. is one of our founders and has served as a director since 1988 and as its President and Chief Executive Officer since April 1997. Dr. Dosoretz is also employed as a physician by our wholly-owned subsidiary, 21st Century Oncology, LLC. Prior to founding the Company, Dr. Dosoretz served as attending physician at the Massachusetts General Hospital. He also was an Instructor and Assistant Professor of Radiation Medicine at Harvard Medical School and Research Fellow of the American Cancer Society. Upon moving to Fort Myers, Florida, he was appointed to the Clinical Faculty as Associate Professor at the University of Miami School of Medicine. He also has been a visiting Professor at Duke University Medical School and is a Distinguished Alumni Visiting Professor in Radiation Oncology at Massachusetts General Hospital,

Harvard Medical School. Dr. Dosoretz is board certified in Therapeutic Radiology by the American Board of Radiology. He is a Fellow of ACRO and of the American College of Radiology and is a member of the International Stereotactic Radiosurgery Society, the American Society for Therapeutic Radiology and Oncology and the American Society of Clinical Oncology. Dr. Dosoretz graduated from the University of Buenos Aires School of Medicine with the Gold medal for being top of his class, and served his residency in Radiation Oncology at the Department of Radiation Medicine at the Massachusetts General Hospital, Harvard Medical School, where he was selected Chief Resident of the department. Dr. Dosoretz's role as founder, President and Chief Executive Officer of the Company, history with the Company and significant operating experience in the health care industry and extensive board experience led to the conclusion that Dr. Dosoretz should serve as a director of the Company.

Bryan J. Carey has been a member of our board of directors since April 2009 and Chief Financial Officer since January 2012. He was previously our interim Chief Financial Officer from September 2009 to March 2010 and May 2011 to December 2011. Mr. Carey is a Managing Director of Vestar, primarily focused on Healthcare investments. He joined Vestar in 2000, having been Executive Vice President, Chief Financial Officer and Managing Director of the European operations of Aearo Corporation, a Vestar portfolio company. Mr. Carey is currently a director and member of the audit committee of Sunrise Medical, Inc. Mr. Carey was a director of Joerns Healthcare, LLC until August 2010. He received his A.B. in economics from Georgetown University and his M.B.A. from the Wharton School of the University of Pennsylvania. Mr. Carey's experience in the health care industry and collective board experience, experience as the Company's interim Chief Financial Officer and background including his personal involvement in the healthcare field led to the conclusion that Mr. Carey should serve as a director of the Company.

Joseph M. Garcia joined us in February 2011 as our Chief Operating Officer. From 2007 to 2011, prior to joining the Company, Mr. Garcia was a Vice President of Operations at DaVita, the leading dialysis company in the United States. Mr. Garcia was responsible for three divisions with 135 dialysis centers and over 40 hospital contracts. Collectively, these divisions represented approximately $425.0 million in revenue. Prior to DaVita, Mr. Garcia was the Senior Vice President of Operations at Sterling Healthcare from 2004 to 2007. Sterling was a hospital Emergency Room management company with 250 contracts across the United States. From 2000 to 2004 Mr. Garcia was a founder and Senior Vice President in both Health Network One and *i*Health Technologies. Health Network One is a specialty network business that contracts with large insurance companies and is a licensed Third Party Administrator (TPA). *i*Health Technologies a healthcare technology company, whose primary product is a proprietary software that is purchased by insurance companies to process and filter their claims prior to payment. From 1998 to 2000 Mr. Garcia was a Senior Vice President of Operations at Vivra, a dialysis provider, until its sale to Gambro and Magellan Behavior Health. From 1996 to 1998 Mr. Garcia was the Vice President of Corporate Development at FPA Medical Management. Mr. Garcia graduated with a B.S.B.A. and M.B.A. from Creighton University in Omaha, Nebraska.

Eduardo Fernandez M.D., Ph.D. joined us in 1998 and has served in his current capacity since February 2011 and formerly as Director of Regional Operations from March 2009 to February 2011. Dr. Fernandez is also employed as a physician by our wholly-owned subsidiary, 21st Century Oncology, Inc. Dr Fernandez, Board Certified in Radiation Oncology, was awarded his medical degree from the University of Malaga, Spain, in 1987. He was Assistant and Associate Professor of Radiology and Medical Physics in his home university. Since 1989 he was in close cooperation with the Department of Biochemical Oncology and Experimental Radiotherapy at Case Western Reserve University in Cleveland, Ohio, including several sabbatical visits. In 1991 he defended a Doctoral Thesis on the molecular biology aspects of Photodynamic Therapy, and was awarded a Ph.D. degree from the University of Malaga. He completed his Radiation Oncology Residency at the Cleveland Clinic Foundation (Callahan Center for Radiation Oncology and Robotics) and served as the Head of Radiation Oncology at the Cleveland Clinic, Florida, where he was directly responsible for the

development of the External Beam Radiation Oncology and Prostate Seed Brachytherapy Programs. Simultaneously he had an Assistant Professorship of Radiology at Ohio State University. He was Chief of Radiation Oncology at the Aventura Comprehensive Cancer Center from 2000 to 2007, Medical Director of the East Coast Operations from 2000 to 2009 and Co-VP of Medical Operations from 2008 to 2009. Dr. Fernandez is a director of 21st Century C.A.R.E., a non-profit dedicated to cancer patient assistance, research and education.

Constantine A. Mantz, M.D. joined us in 2000 and has served in his current capacity since February 2011 and formerly as Senior Vice President of Clinical Operations from March 2009 to February 2011. Dr. Mantz is also employed as a physician by our wholly-owned subsidiary, 21st Century Oncology, Inc. Dr. Mantz received a Bachelor of Science Degree in Biology from Loyola University of Chicago. He earned his medical degree from the University of Chicago's Pritzker School of Medicine and did a surgical internship at the Hennepin County Medical Center in Minneapolis. Dr. Mantz completed his radiation oncology residency at the University of Chicago Hospitals, is Board Certified in Radiation Oncology by the American Board of Radiology and is a member of ACRO, the American Medical Association, ASTRO and AFROC. During the course of his career, Dr. Mantz has been involved in numerous radiation therapy research projects, published professional journal articles and given lectures and presented abstracts and poster sessions at national meetings concerning cancer treatment. Dr. Mantz has a special interest in the study and treatment of prostate cancer and breast cancer.

Norton L. Travis has been our Executive Vice President and General Counsel since February 2008 after having served as our outside general counsel for the prior five years. As outside counsel, Mr. Travis oversaw all legal aspects of the Company's expansion transactions, as well as our legal compliance program. Prior to joining us, Mr. Travis served as a partner and the Chair of the Business Practice Group of Garfunkel, Wild & Travis, P.C., a specialty health-care law firm he co-founded in 1980. Mr. Travis is currently a director and a member of the compensation committee and the capital allocations committee of CareCore National, LLC. Mr. Travis received his B.A. from the University of Massachusetts and his J.D. from Hofstra University School of Law.

Madlyn Dornaus joined us in 2004 and has served in her current capacity as Senior Vice President and Chief Compliance Officer since September 2009. Ms. Dornaus received her B.S. degree from Illinois State University and her M.B.A. from the University of Illinois. Prior to joining the Company, Ms. Dornaus was National Vice President for Per Se Technologies and held operational leadership roles as Regional Vice President at Curative Health Services and Concentra. She is a Certified Healthcare Compliance Officer and a member of the Medical Group Management Association.

Joseph Biscardi joined us in June 1997 as our Vice President, Assistant Treasurer, Controller and Chief Accounting Officer. Prior to joining the Company, Mr. Biscardi worked for PricewaterhouseCoopers, LLP from 1993 to June 1997. Mr. Biscardi holds a B.B.A. in accounting from Hofstra University. He is a Certified Public Accountant in New York and a member of the American Institute of Certified Public Accountants, a member of the Healthcare Financial Management Association and a member of the Financial Executives International.

J. Dennis Humble joined us in May 2011 as our Treasurer. J. Dennis Humble joined us in April, 2011 as Treasurer. Prior to joining us he was Vice President and Treasurer with Res-Care, Inc. in Louisville, KY, from September 2007 to April 2011. Prior to that he was Chief Financial Officer of the Kentucky Housing Corporation, an agency of the Commonwealth of Kentucky, from June 2006 to September 2007. Mr. Humble holds an MBA in Finance from Bellarmine University in Louisville, KY and is a Certified Treasury Professional.

Daniel H. Galmarini has served as our Chief Technology Officer since August 1990. Mr. Galmarini received his degree in Physics from the School of Exact Sciences of University of La Plata, Argentina. In 1983, Mr. Galmarini obtained his certification of Specialist in Physics from the National Energy Commission of Argentina. Between 1983 and 1990, he became Director of Physics of multiple

institutions. He has a certification in Radiotherapy Physics from the American Board of Radiology. He has held several teaching positions in universities in Argentina, and was instructor of theoretical physics in Central America and Lecturer of Medical Physics at the University of Miami in Florida. He has received several awards including the Best Scientific Work in Oncology in 1985 by the National Academy of Medicine in Argentina on the subject of Neuro-Oncological Stereotaxy. Mr. Galmarini is the author of several publications in a variety of fields including teletherapy and brachytherapy physics of radiation therapy, neurosurgery, radiobiology and computers applied to radiation therapy. Mr. Galmarini is a member of the American Association of Physics in Medicine and the American Brachytherapy Society.

Kurt L. Janavitz joined us in March 2011 as our Senior Vice President of Managed Care and Network Development. Prior to joining us, Mr. Janavitz worked for Assurant Health as Vice President, Provider Management from September 2009 to March 2011 and UnitedHealth Group as Vice President, Network Management from May 2003 to September 2009. Previously, Mr. Janavitz spent a number of years working in various consulting and management roles for Ernst & Young, Tiber Group (now Navigant Consulting), Sachs Group (now Thomson Reuters Healthcare) and Dimension Data. Mr. Janavitz holds a Masters in Business Administration in Finance and Marketing with distinction from the Kellogg Graduate School of Management at Northwestern University and a Bachelor of Arts in Psychology summa cum laude from Tufts University. He is also an active member of Rotary International and a past board member of the American Heart Association of Southeastern Wisconsin.

James L. Elrod, Jr. has been a member of our board of directors and the Chairman of our board of directors since February 2008. Mr. Elrod is a Managing Director of Vestar and is currently the Co-Head of its Global Healthcare Group. Prior to joining Vestar in 1998, Mr. Elrod was Executive Vice President, Finance and Operations for Physicians Health Service, a public managed care company. Prior to that, he was a Managing Director and Partner of Dillon, Read & Co. Inc. Mr. Elrod is currently a director of Essent Healthcare, Inc. and National Mentor Holdings, Inc. and was a director of Joerns Healthcare, LLC until August 2010. Mr. Elrod received his A.B. from Colgate University and his M.B.A. from Harvard Business School. Mr. Elrod's experience in the health care industry and collective board experience, financial experience, and diverse personal background led to the conclusion that Mr. Elrod should serve as a director of the Company.

Anil Shrivastava has been a member of our board of directors since February 2008. Mr. Shrivastava is a Managing Director of Vestar, primarily focused on Healthcare investments. Mr. Shrivastava joined Vestar in 2007. Previously, he was a partner at Bain & Company, Inc., the global consulting firm, as a leader in their healthcare practice. Mr. Shrivastava is currently a director of MediMedia USA, LLC, Sunrise Medical, Inc. and DeVilbiss Healthcare, LLC. Mr. Shrivastava received his B.A. from Harvard University and his M.B.A. from Harvard Business School. Mr. Shrivastava's experience in the health care industry and collective board experience, financial experience, and diverse personal background led to the conclusion that Mr. Shrivastava should serve as a director of the Company.

Erin L. Russell has been a member of our board of directors since February 2008. Ms. Russell is a Principal of Vestar, and is primarily focused on Healthcare investments. Ms. Russell joined Vestar in 2000. Previously, she was a member of the mergers and acquisitions group at PaineWebber, Inc. Ms. Russell is currently a director and a member of the audit committee of DynaVox Inc. In addition, she serves on the National Advisory Board of the Jefferson Scholars Foundation at the University of Virginia. Ms. Russell received a B.S. from the McIntire School of Commerce at the University of Virginia and her M.B.A. from Harvard Business School. Ms. Russell's experience in the health care industry board experience and diverse personal background led to the conclusion that Ms. Russell should serve as a director of the Company.

James H. Rubenstein, M.D. joined us in 1989 as a physician and has served as Secretary, Medical Director and as a director since 1993. Dr. Rubenstein is also employed as a physician by our wholly-owned subsidiary, 21st Century Oncology, LLC. Prior to joining the Company, Dr. Rubenstein was an Assistant Professor of Radiation Oncology at the University of Pennsylvania and later became Co-Director of its Radiation Oncology Residency Program. He also served as Chairman of the Department of Medicine for Columbia Regional Medical Center in Southwest Florida and became a Clinical Assistant Professor at the University of Miami School of Medicine's Department of Radiology. He is board certified in Internal Medicine by the American Board of Internal Medicine and in Radiation Oncology by the American Board of Radiology. He graduated from New York University School of Medicine and completed his internship and residency in internal medicine at Beth Israel Hospital in Boston, at the same time working as an Assistant Instructor in internal medicine for Harvard University's School of Medicine. Dr. Rubenstein's years of experience in the health care industry career, particularly in radiation oncology and with the Company, as well as his familiarity with all aspects of its business led to the conclusion that Dr. Rubenstein should serve as a director of the Company.

Howard M. Sheridan, M.D. is one of our founders and has served as a director since 1988. Dr. Sheridan planned and developed our first radiation treatment center. Prior to joining us, Dr. Sheridan served as President of the medical staff at Southwest Florida Regional Medical Center as well as chairman of the Department of Radiology. Dr. Sheridan currently serves as Chairman of Edison Bancshares, Inc. He previously served on the Advisory Board of Southeast Bank, N.A., and also served as a founding Director and member of the Executive Compensation and Loan Committee of Heritage National Bank from 1989 until September 1996, when Heritage was acquired by SouthTrust Corporation. Dr. Sheridan has practiced interventional radiology and diagnostic radiology in Fort Myers, Florida from 1975 until accepting the chairmanship in April 2004. Dr. Sheridan is a member of the American Medical Association, the Florida Medical Association, and the American College of Radiology. Dr. Sheridan is the Vice President of 21st Century C.A.R.E., a non-profit dedicated to cancer patient assistance, research and education. Dr. Sheridan is also on the Dean's Counsel of Tulane Medical School. He graduated from Tulane Medical School and completed his residency at the University of Colorado Medical Center. Dr. Sheridan is board certified by the American Board of Radiology and the American Board of Nuclear Medicine. Dr. Sheridan's board experience, years of experience in the health care industry career, particularly in radiation oncology and with the Company, as well as his familiarity with all aspects of its business since its founding led to the conclusion that Dr. Sheridan should serve as a director of the Company.

Board Composition

Our Bylaws provide that our board of directors shall consist of the number of directors so determined by its board of directors. Each director serves for annual terms and until his or her successor is elected and qualified. Vestar indirectly controls a majority of the capital stock of Parent, which in turn holds 100% of the capital stock of the Company, and as such, Vestar has the ability to elect all of the members of our board of directors. The Company is also subject to certain agreements, which provide Vestar with the ability to designate a specified number of members of our board of directors and RT Investments' board of managers. The Company's board of directors presently consists of seven members.

We are indirectly controlled by RT Investments, the direct owner of 100% of the capital stock of Parent. RT Investments does not have a formal policy regarding the procedures by which equityholders may recommend nominees to its board of managers. However, any recommendations received from equityholders pursuant to our submission procedures are generally evaluated in the same manner that potential nominees suggested by board members are evaluated. RT Investments is party to an Amended and Restated Securityholders Agreement, pursuant to which the parties thereto must cause the board

of managers of RT Investments to consist of four managers designated by Vestar and its affiliates, two independent managers designated by an affiliate of Vestar after consultation with Dr. Dosoretz, and two managers that are executives of the Company designated by Dr. Dosoretz after consultation with Vestar, for so long as Dr. Dosoretz is the Chief Executive Officer of the Company, subject to a reduction of the number of managers that are executives of the Company upon a decrease in the ownership interests in RT Investments held by certain management holders or failure by the Company to achieve certain performance targets. In addition, RT Investments is governed by an Amended and Restated Limited Liability Company Agreement, pursuant to which Vestar and its affiliates shall determine the number of persons comprising the board of managers of RT Investments in accordance with the Amended and Restated Securityholders Agreement, all of whom shall be individuals as determined pursuant to the Amended and Restated Securityholders Agreement. See "Item 13. Certain Relationships and Related Transactions, and Director Independence."

Board Committees

RTS's board of directors has the authority to appoint committees to perform certain management and administration functions. RTS's board of directors has provided for an Audit/Compliance Committee, a Capital Allocation Committee and a Compensation Committee.

Audit/Compliance Committee

Ms. Russell serves on the Audit/Compliance Committee, with Ms. Russell serving as the Chair. The Audit/Compliance Committee is responsible for reviewing and monitoring our accounting controls, related party transactions, internal audit functions and compliance with federal and state laws that affect our business and recommending to the board of directors the engagement of our outside auditors. The Audit/Compliance Committee met eight times during 2010 and seven times during 2011. The Audit/Compliance Committee operates under a written charter effective as of May 16, 2008 adopted by our board of directors in May 2008. Our board of directors has determined that each of its members is financially literate. However, as we are now privately held and controlled by affiliates of Vestar, our board of directors has determined that it is not necessary to designate one or more of its Audit/Compliance Committee members as an "audit committee financial expert" at this time.

Capital Allocation Committee

Messrs. Elrod, Carey and Shrivastava and Ms. Russell serve on the Capital Allocation Committee, with Mr. Elrod serving as the Chair. The Capital Allocation Committee reviews and either approves, on behalf of the board of directors, or recommends to the Company's board of directors for approval all material expenditures related to equipment, acquisitions and de novo development, among others. The Capital Allocation Committee met one time during 2010 and six times during 2011. The Capital Allocation Committee operates under a written charter effective as of May 16, 2008 adopted by our board of directors in May 2008.

Compensation Committee

Messrs. Sheridan and Elrod serve on the Compensation Committee, with Mr. Elrod serving as the Chair. The Compensation Committee reviews and either approves, on behalf of our board of directors, or recommends to our board of directors for approval the annual salaries and other compensation of our executive officers and individual unit incentive awards. The Compensation Committee also provides assistance and recommendations with respect to our compensation policies and practices and assists with the administration of our compensation plans. The Compensation Committee met one time during 2010 and one time during 2011. The Compensation Committee operates under a written charter effective as of May 16, 2008 adopted by our board of directors in May 2008.

Compensation Committee Interlocks and Insider Participation

Messrs. Sheridan and Elrod serve on the Compensation Committee. No executive officer of the Company served as a director of any corporation for which any of these individuals served as an executive officer, and there were no other compensation committee interlocks with the companies with which these individuals or the Company's other directors are affiliated.

Dr. Sheridan has certain related party relationships with us requiring disclosure under the rules and regulations of the SEC. These related party relationships include, among other things, ownership interests held by Dr. Sheridan in real estate partnerships, which own treatment centers and properties leased by the Company, a medical services provider, to which we provide billing and collections services and an insurance company which provides us with malpractice insurance coverage. See "Item 13. Certain Relationships and Related Transactions, and Director Independence." Dr. Sheridan is one of our founders and previously served as Chairman of our board of directors until February 2008.

Code of Ethics

RTS's board of directors expects its members, as well as its officers and employees, to act ethically at all times and to acknowledge in writing their adherence to the policies comprising its code of conduct and as applicable, in RTS's Code of Ethics for Senior Financial Officers and Chief Executive Officer. The code of ethics is posted on our website located at *www.rtsx.com* under the heading "Code of Conduct for Principal Executive Officers and Senior Financial Officers" We intend to disclose any amendments to RTS's code of ethics and any waiver from a provision of such code, as required by the SEC, on our website within five business days following such amendment or waiver. Copies of the Code of Ethics are available upon request, without charge, by writing or telephoning us at Radiation Therapy Services, Inc, 2270 Colonial Boulevard, Fort Myers, Florida 33907, Attn: Corporate Secretary, (239) 931-7275.

Item 11. *Executive Compensation*

The business and operations of the Company are managed through RTS, our wholly owned operating subsidiary, which is the parent of our provider subsidiaries. As such, the information set forth below and in the remaining sections of this Item 11 are presented with respect to RTS.

References in this Item 11 to "we", "us", "our" and "the Company" are references to Radiation Therapy Services, Inc. and its subsidiaries, consolidated professional corporations and associations and unconsolidated affiliates, unless the context requires otherwise or unless indicated otherwise.

Compensation Discussion and Analysis

The following discussion and analysis of compensation arrangements of our named executive officers should be read together with the compensation tables and related disclosures with respect to our current plans, considerations, expectations and determinations regarding compensation.

Executive Summary

The primary objectives of our executive compensation policies are to attract and retain talented executives to effectively manage and lead our Company and create value for our equityholders. Through our executive compensation policies, we seek to align the level of our executive compensation with the achievement of our corporate objectives, thereby aligning the interests of our management with those of our equityholders.

The compensation of our named executive officers generally consists of base salary, annual cash incentive payments, long-term equity incentives and other benefits and perquisites. In addition, our named executive officers are eligible to receive severance or other benefits upon termination of their

employment with us. In setting an individual executive officer's initial compensation package and the relative allocation among different types of compensation, we consider the nature of the position being filled, the scope of associated responsibilities, the individual's qualifications, as well as Vestar's experience with other companies in its investment portfolio and general market knowledge regarding executive compensation.

The discussion below explains our compensation decisions with respect to fiscal year 2011, our last fiscal year. Our named executive officers are Daniel E. Dosoretz, M.D., our President and Chief Executive Officer since April 1997, Joseph M. Garcia, our Chief Operating Officer since March 2011, Constantine A. Mantz, M.D. who joined us in 2000 and has served as our Chief Medical Officer since February 2011 and formerly as Senior Vice President of Clinical Operations from March 2009 to February 2011, Kerrin E. Gillespie, who served as our Senior Vice President and Chief Financial Officer from March 2010 until May 2011 and Norton L. Travis who has been our Executive Vice President and General Counsel since joining us in February 2008. Our named executive officers also include Bryan J. Carey, our Vice Chairman and Chief Financial Officer since January 2012, who has served as our Interim Chief Financial Officer previously from September 2009 until March 2010 and May 2011 to December 2011.

Executive Compensation Philosophy

The compensation policies for our named executive officers have been designed based upon our view that the ownership by management of equity interests in our business is the most effective mechanism for providing incentives for management to maximize gains for equityholders, that annual cash incentive compensation should be linked to metrics that create value for our equityholders and that other elements of executive compensation should be set at levels that are necessary, within reasonable parameters, to successfully attract, retain and motivate optimally talented and experienced executives.

Role of Our Compensation Committee

Our Compensation Committee evaluates and determines the levels and forms of individual compensation for our named executive officers. Under the term of its charter, our Compensation Committee reviews and either approves, on behalf of the Company's board of directors, or recommends to the Company's board of directors for approval the annual salaries and other compensation for our executive officers and individual unit incentive awards. The Compensation Committee develops and determines all components of executive officer compensation, as well as provides assistance and recommendations to the Company's board of directors with respect to our incentive-compensation plans, equity-based plans, compensation policies and practices and assists with the administration of our compensation and benefit plans. Messrs. Sheridan and Elrod serve on the Compensation Committee, which met one time during 2011.

Compensation Determination Process

Our Compensation Committee determines or recommends to the board of directors for determination the compensation of each of our named executive officers and solicits input from our Chief Executive Officer in determining the compensation (particularly base salary and annual cash incentive payments) of our named executive officers. The Compensation Committee does not retain compensation consultants to review our policies and procedures with respect to executive officer compensation

Effect of Accounting and Tax Treatment on Compensation Decisions

In the review and establishment of our compensation program, we consider the anticipated accounting and tax implications to us and our named executive officers. While we consider the applicable accounting and tax treatment of alternative forms of equity compensation, these factors alone are not dispositive, and we also consider the cash and non-cash impact of the programs and whether a program is consistent with our overall compensation philosophy and objectives.

Risk Considerations in Determining Compensation

We regularly assess our compensation policies and practices in response to current public and regulatory concern about the link between incentive compensation and excessive risk taking by corporations. We have concluded that our compensation program does not motivate imprudent risk taking and any risks involved in compensation are not reasonably likely to have a material adverse effect on the Company. In reaching this conclusion, we believe that the following risk oversight and compensation design features guard against excessive risk-taking:

- Establishing base salaries consistent with executives' responsibilities so that they are not motivated to take excessive risks to achieve a reasonable level of financial security;
- Determining cash and equity incentive awards based on achievement of performance metrics that provide a simple, but encompassing and powerful, performance goal that aligns the strategies and efforts of the enterprise across operational groups and geographies, and also helps ensure that extraordinary compensation is tied to creation of enhanced value for stockholders;
- Designing long-term compensation, including vesting provisions for equity compensation awards, to reward executives for driving sustainable, profitable, growth for stockholders; and
- Ensuring oversight of the Compensation Committee in the operation of our compensation plans.

Elements of Compensation

We generally deliver executive compensation through a combination of annual base salary, annual cash incentive payments, long-term equity incentives and other benefits and perquisites. We believe that this mix of elements is useful in achieving our primary compensation objectives. The payment of executive compensation is determined by the Compensation Committee, and we do not target any particular form of compensation to encompass a majority of annual compensation provided to our executive officers.

Base Salary and Production Incentive Bonuses. Base salaries are intended to provide a fixed level of compensation sufficient to attract and retain an effective management team when considered in combination with other performance- based components of our executive compensation program. We believe that the base salary element is required to provide our named executive officers with a stable income stream that is commensurate with their responsibilities and competitive market conditions. Annual base salaries are established on the basis of market conditions at the time we hire an executive. Any subsequent modifications to annual base salaries are influenced by the performance of the executive, the increased/decreased duties of the executive and by significant changes in market conditions. We do not align compensation for our executive officers with market pay percentile benchmarks. In addition, we are party to physician employment agreements with our physician named executive officers, who provide significant clinical leadership in the Company beyond their executive management roles in their capacities as physicians. These physician employment agreements provide for production and ancillary incentive bonus arrangements generally based on achievement of a certain level of collections or revenues by such individuals.

The current base salaries described below were negotiated in connection with the Merger and are based in part on salaries paid prior to the Merger. A summary of the base salary and production incentive bonus arrangements with our named executive officers is as follows, except for Mr. Gillespie who joined the Company in March 2010 and left the Company in May 2011 and Joseph Garcia who joined the Company in March 2011:

- Daniel E. Dosoretz, M.D.—We entered into an executive and a physician employment agreement with Dr. Dosoretz in connection with the Merger, dated effective as of February 21, 2008, which provide for annual base salaries of $1,500,000 and $500,000, respectively. Dr. Dosoretz is also eligible to participate in certain production and ancillary bonus arrangements associated with the Company's Lee County, Florida radiation oncology centers and certain other ancillary services provided in the Lee County, Florida local market.
- Joseph M. Garcia—We entered into an executive employment agreement with Mr. Garcia, dated effective as of March 1, 2011, which provides for an annual base salary of $400,000.
- Constantine A. Mantz, M.D.—We entered into a physician employment agreement with Dr. Mantz, dated effective as of July 1, 2003 and as amended, which provides for an annual base salary of $1,100,000 and an annual production incentive bonus arrangement based on a percentage of the professional component collections associated with the Company's Lee and Monroe County, Florida radiation oncology centers and certain other ancillary services provided in the Lee County, Florida local market.
- Kerrin E. Gillespie—We entered into an executive employment agreement with Mr. Gillespie, dated effective as of February 8, 2010, which provides for an annual base salary of $400,000. Mr. Gillespie's employment ended on May 16, 2011.
- Norton L. Travis—We entered into an executive employment agreement with Mr. Travis in connection with the Merger, dated effective as of February 21, 2008, which provides for an annual base salary of $900,000.
- Bryan J. Carey—Mr. Carey has served as the Company's Interim Chief Financial Officer since May 2011 and previously served as the Company's interim Chief Financial Officer from September 2009 to March 2010 and has been a member of the Company's board of directors since April 2009. Mr. Carey is a Managing Director of Vestar, primarily focused on healthcare investments. We did not enter into an employment agreement with Mr. Carey and Mr. Carey does not and did not receive any remuneration in connection with his service as interim Chief Financial Officer. Effective January 1, 2012, Mr. Carey's annual base salary is $475,000. We are currently negotiating an executive employment agreement with Mr. Carey.

Annual Cash Incentive Payments. In addition to annual base salaries, our Compensation Committee and Company's board of directors generally award annual cash incentive payments to our named executive officers. The annual cash incentive payments are intended to compensate our named executive officers for achieving operating performance objectives in the current year that are important to our success.

Cash incentive payments are awarded pursuant to individual bonus arrangements with each named executive officer for each fiscal year. This bonus arrangement is designed to motivate, reward and acknowledge achievement by our employees by explicitly tying annual cash bonus payments to the achievement of annual performance targets based upon our consolidated financial results, as adjusted based upon individual performance objectives. Our performance-based bonus plan is administered jointly by our Chief Financial Officer, who is responsible for monitoring the financial performance measurements, and, in respect of our executive officers, our Chief Executive Officer, who is responsible for monitoring individual performance measurements for such individuals. Our Compensation Committee approves all targets set by the Company's board of directors and payouts under our bonus

arrangements. Executives are generally eligible for payments under our performance-based bonus arrangement if they have earned such payments for the prior fiscal year.

Pursuant to the terms of their executive employment agreements, certain named executive officers were eligible to earn a target annual cash incentive payment for fiscal year 2011 equal to either a defined minimum amount or a percentage of that named executive officer's annual base salary, as further described below:

- For fiscal year 2011, Dr. Dosoretz was eligible to earn an annual cash performance incentive bonus award with a target bonus amount not less than $1,500,000 pursuant to a bonus plan based on factors including, without limitation, the Company's achievement of pro forma adjusted earnings before interest, taxes, depreciation and amortization ("PF Adjusted EBITDA"), net debt targets and achievement of specified objectives. The relative weight of each factor in determining the cash performance incentive bonus award was determined by the Company's board of directors. PF Adjusted EBITDA also includes certain adjustments, such as loss on extinguishment of debt, non-cash impairment losses and gains/losses on disposal of assets, minority interest, equity-based compensation, employee severance and other costs, acquisition costs, management fee to Vestar, adjustment related to sale-leaseback accounting, litigation expenses, non-cash rent expense and other adjustments.
- For fiscal year 2011, Mr. Garcia is eligible to earn an annual cash performance incentive bonus award with a target bonus amount up to 60% of his base salary pursuant to a bonus plan based on factors including, without limitation, the Company's achievement of PF Adjusted EBITDA, net debt targets and achievement of specified objectives.
- For fiscal year 2011, Mr. Gillespie is eligible to earn an annual cash performance incentive bonus award with a target bonus amount up to 60% of his base salary pursuant to a bonus plan based on factors including, without limitation, the Company's achievement of PF Adjusted EBITDA, net debt targets and achievement of specified objectives.
- For fiscal year 2011, Mr. Travis was eligible to earn an annual cash performance incentive bonus award with a target bonus amount not less than $300,000 pursuant to a bonus plan based on factors including, without limitation, the Company's achievement of PF Adjusted EBITDA, net debt targets and achievement of specified objectives.

After target bonus award amounts are established as a defined minimum amount or percentage of each named executive officer's base salary, the Company's board of directors establishes overall Company performance targets as the next step in determining annual cash bonus payments. For fiscal year 2011, the Company's board of directors assigned a 60% weighting to PF Adjusted EBITDA performance measure, a 40% weighting to net debt performance measure to encourage management to focus more on making long-term investments to grow our business and a discretionary bonus for the achievement of specified objectives.

At the on-target level of achievement for the PF Adjusted EBITDA performance metric, a named executive officer's bonus payment is equal to 100% of his or her target bonus amount. At the maximum target level of achievement, a named executive officer's bonus payment is equal to 200% of his target bonus amount. At the minimum target level of achievement for PF Adjusted EBITDA and Net Debt performance measures, a named executive officer's bonus payment is equal to 25% and 15%, respectively, of his target bonus amount. Bonus payments for actual results that fall between the minimum and maximum target performance levels are adjusted on a linear basis.

The following table illustrates our overall performance in relation to our targets for PF Adjusted EBITDA and net debt targets as well as achievement of specified objectives for fiscal year 2011:

Type of Financial Performance Metric	Minimum Target Level of Achievement	On-Target Level of Achievement	Maximum Target Level of Achievement	Actual Level of Achievement	Level of Target Achieved
PF Adjusted EBITDA	$129.0	$139.0	$145.0	$128.1	Not Achieved
Net Debt	$656.3	$668.7	$ —	$675.3	Not Achieved
Specified Objectives					Achieved

Our bonus plan for fiscal year 2011 is structured in the same manner as it was for fiscal year 2010, with financial performance being evaluated against PF Adjusted EBITDA and net debt targets and achievement of specified objectives. The timing of payments under the bonus plan for fiscal year 2011 is expected to be consistent with that for fiscal year 2010.

Discretionary Cash Bonuses. The compensation committee awarded a discretionary cash bonus to the executive management team for the achievement of certain milestone accomplishments. The 2011 discretionary cash bonus amounts awarded to the executive management team are noted in the following summary compensation table under the caption "non-equity incentive plan compensation.

The compensation committee determined the discretionary bonus awards based on the 2011 milestone accomplishments which included the following:

- Closing, integration and value added initiatives to the Medical Developers Acquisition.
- Closing the MHP transaction, developing a group practice model in the state of Michigan.
- Closing the radiation treatment center acquisitions in Redding, California and Goldsboro North Carolina and entering into a letter of intent for the purchase of a radiation treatment center in Sarasota, Florida.
- Strengthening the Company's clinical working relationships through 20 physician liaisons.
- Managed care pricing strategy and implementation.
- Expansion of medical group practices through hiring and acquisitions of approximately 17 physicians.
- September 30, 2011 credit agreement amendment to provide flexibility for growth and covenant modifications. Increase in the Revolver by $50.0 million.
- International acquisition of five radiation treatment centers in Argentina in November 2011.

Discretionary Cash Bonuses. In addition to the amounts described above that were awarded under our Annual Cash Incentive Payments in 2011, the Company's board of directors awarded a discretionary cash bonus in fiscal year 2011 to Mr. Travis in the amount of $50,000 in recognition of his work related to our business development activities and a relocation cash bonus in fiscal year 2011 to Mr. Garcia in the amount of $50,000 associated with his employment with the Company. Although the Compensation Committee does not anticipate that discretionary cash bonuses will be routinely awarded, it reserves the right to make such awards in the future as circumstances warrant.

Long-Term Equity Incentives. We believe that our long-term financial success is achieved in part through an ownership culture that encourages our named executive officers to focus on our long-term performance through the use of equity-based compensation incentives.

The capital structure of RT Investments consists of four different classes of limited liability company units: non-voting preferred equity units, Class A voting equity units, Class B non-voting equity units and Class C non-voting equity units.

On February 21, 2008, in connection with the Merger, we allowed our management to invest in RT Investments by exchanging all or a portion of their shares in the predecessor Company's common stock into non-voting preferred equity units of RT Investments and Class A voting equity units of RT Investments and the number of non-voting preferred equity units and Class A voting equity units of RT Investments held by our named executive officers is set forth in "Security Ownership of Certain Beneficial Owners and Management."

Also, on February 21, 2008, in connection with the Merger, RT Investments adopted a new equity-based plan and authorized for issuance under the plan approximately 1,494,111 units of limited liability company interests consisting of 526,262 Class B non-voting equity units and 967,849 Class C non-voting equity units. The Class B non-voting equity units time vest over 48 months and the Class C non-voting equity units vest annually for 34 months based on certain performance conditions and/or investment performance conditions being met or achieved and, in all cases, assuming continued employment. The performance conditions relate to the Company achieving PF Adjusted EBITDA and net debt targets that were established in connection with the Merger. The vesting schedule for the units described above was designed to motivate our named executive officers and other members of management to enhance our financial and operational performance and equity value over the long-term as well as to promote executive retention. The following table presents the outstanding grants of Class B non-voting equity units and Class C non-voting equity units to our named executive officers as of December 31, 2011:

Name	Class B Units	Class C Units
Daniel E. Dosoretz, M.D., President and Chief Executive Officer	282,428	337,235
Joseph M. Garcia, Chief Operating Officer	20,831	53,874
Constantine A. Mantz, M.D., Chief Medical Officer	8,420	21,777
Kerrin E. Gillespie, former Senior Vice President and Chief Financial Officer	4,166	—
Norton L. Travis, Executive Vice President and General Counsel	42,101	108,883
Bryan J. Carey, Chief Financial Officer	—	—

Deferred Compensation Plan. We offer our named executive officers the opportunity to participate in our 401(k) Profit Sharing Plan ("401(k) Plan"), which is a tax-qualified plan. Our discretionary contributions to the 401(k) Plan are based upon our annual financial performance.

Other Benefits. We also provide various other benefits to certain of our named executive officers that are intended to be part of a competitive compensation program. These benefits include:

- medical and life insurance;
- flexible spending accounts;
- vacation time;
- reimbursement for tax preparation and legal services;
- relocation benefits; and
- utilization of Company aircraft.

We believe that these benefits are comparable to those offered by other companies.

Severance and Change in Control Benefits

Our named executive officers are entitled to certain severance benefits as set forth in their respective employment agreements in the event of termination of employment. We believe these

benefits are an essential element of our compensation program for our named executive officers and assist us in recruiting and retaining talented individuals. Our Compensation Committee believes that these benefits are valuable as they address the valid concern that it may be difficult for our named executive officers to find comparable employment in a short period of time in the event of termination. The severance benefits may differ for named executive officers depending on the positions they hold and how difficult it might be or how long it might take for them to find comparable employment. The employment agreements of our named executive officers do not contain change in control benefit provisions providing for payments but the Management Unit Subscription Agreements for Class B non-voting equity units of RT Investments and Class C non-voting equity units of RT Investments to contain certain acceleration provisions in the event of a sale of the Company.

Summary Compensation Table

The following table provides summary information concerning compensation paid or accrued by us to or on behalf of our named executive officers for services rendered to us during the prior three fiscal years.

	Fiscal Year	Salary ($)	Bonus ($)(1)	Stock Awards	Non-Equity Incentive Plan Compensation ($)	Other Annual Compensation ($)	Total ($)
Daniel E. Dosoretz M.D.	2011	2,000,000	25,065	—	600,000	22,047(2)	2,647,112
President, Chief Executive	2010	2,000,000	29,479	—	600,000	87,154(2)	2,716,633
Officer and Director	2009	2,000,000	22,937	—	600,000	116,536(2)	2,739,473
Joseph M. Garcia, ...	2011	346,154	50,000	—	200,000	—	596,154
Chief Operating Officer	2010	—	—	—	—	—	—
	2009	—	—	—	—	—	—
Constantine A. Mantz, M.D. . . .	2011	961,000	570,895	—	—	30(4)	1,531,925
Chief Medical Officer	2010	840,000	637,479	—	—	—	1,477,479
	2009	689,346	809,095	—	—	—	1,498,441
Norton L. Travis	2011	900,000	50,000	—	200,000	129(4)	1,150,129
Executive Vice President and	2010	900,000	60,000	—	120,000	2,450(3)	1,082,450
General Counsel	2009	900,000	180,000	—	120,000	2,450(3)	1,202,450
Kerrin Gillespie(5)	2011	161,981	—	—	—	29(4)	162,010
former Chief Financial Officer	2010	307,692	60,000	—	76,000	—	443,692
Bryan J. Carey(6)	2011	—	—	—	—	100,000	—
Chief Financial Officer	2010	—	—	—	—	—	—
	2009	—	—	—	—	—	—

(1) The amounts set forth in this column represent discretionary bonuses approved by the Company's board of directors except for Dr. Dosoretz's 2011 - 2009 bonuses and Dr Mantz's 2011-2009 bonuses, which were based on production and ancillary bonus arrangements set forth in their respective physician employment agreements.

(2) These amounts consist of: (i) compensation associated with the personal use of the Company's corporate aircraft in 2011, 2010 and 2009 in the amounts of $21,918, $84,575 and $111,377, respectively; (ii) discretionary company profit-sharing contributions to our Profit Sharing 401(k) and Retirement Plan in 2010 and 2009 in the amounts of $2,450 and $2,450, respectively; and (iii) life insurance premiums paid by the Company in 2011, 2010 and 2009 of $129, $129 and $2,709, respectively.

(3) These amounts consist of discretionary company profit-sharing contributions to our Profit Sharing 401(k) and Retirement Plan in 2010 and 2009.

(4) These amounts consist of life insurance premiums paid by the Company in 2011.

(5) Mr. Gillespie's employment commenced on March 15, 2010 and ended on May 16, 2011.

(6) Mr. Carey's employment commenced on January 1, 2012. Mr. Carey has served as our Interim Chief Financial Officer since May 2011 and previously served as our interim Chief Financial Officer from August 2009 until March 14, 2010. In 2011 we recruited Mr. Carey and awarded Mr. Carey $100,000 for his interim services as Chief Financial Officer.

Grants of Plan-Based Awards in Fiscal 2011

The following table provides supplemental information relating to grants of plan-based awards to our named executive officers in fiscal 2011.

	Payout Levels Under Non-Equity Incentive Plan Awards(1)		
	Minimum ($)	Target ($)	Maximum ($)
Daniel E. Dosoretz, M.D.	300,000	1,500,000	3,000,000
Joseph M. Garcia	48,000	240,000	480,000
Constantine A. Mantz, M.D.	—	—	—
Kerrin E. Gillespie	48,000	240,000	480,000
Norton L. Travis	60,000	300,000	600,000
Bryan J. Carey	—	—	—

(1) Thresholds under our non-equity performance incentive bonus plan are determined annually by the Company's board of directors. Amounts represent potential payouts relating to 2011 based on current based compensation. Amounts set forth in this table exclude the achievement of specified objectives, which if achieved could provide an additional 20% bonus based on a named executive officer's base salary.

	Payout Levels Under Equity Incentive Plan Awards				All Other Stock Awards: Number of Shares of Stock or Units(#)
	Grant Date(1)	Target (#)	Unit Class	Grant Date Fair Value of Equity Awards($)(2)	
Daniel E. Dosoretz, M.D.	—	—	—	—	—
Joseph M. Garcia	3/01/11	20,831	Class B	114,362	—
	3/01/11	53,874	Class C	262,905	—
Constantine A. Mantz, M.D.	—	—	—	—	—
Kerrin E. Gillespie	—	—	—	—	—
Norton L. Travis	—	—	—	—	—
Bryan J. Carey	—	—	—	—	—

(1) Date on which the restricted units were transferred to the named executive officer.

(2) Reflects the grant date fair value computed in accordance with Accounting Standards Codification 718.

Outstanding Equity Awards at 2011 Fiscal-Year End

The following table provides information regarding outstanding equity awards held by our named executive officers as of the end of fiscal 2011.

	Stock Awards					
				Equity Incentive Plan Awards		
	Number of Shares or Units of Stock That Have Not Vested(#)		Market Value of Shares or Units of Stock That Have Not Vested($)(c)	Number of Unearned Shares, Units or Other Rights That Have Not Vested(#)		Market or Payout Value of Unearned Shares, Units or Other Rights That Have Not Vested($)(c)
Daniel E. Dosoretz, M.D.	70,607	Class B Units(a)	387,632	299,764	Class C Units(a)	1,462,850
Joseph M. Garcia	15,623	Class B Units(b)	85,772	53,874	Class C Units(b)	262,905
Constantine A. Mantz, M.D.	2,105	Class B Units(a)	11,557	19,357	Class C Units(a)	94,462
Kerrin E. Gillespie	—	Class B Units	—	—	Class C Units	—
Norton L. Travis	10,525	Class B Units(a)	57,784	96,785	Class C Units(a)	472,310
Bryan J. Carey	—	Class B Units	—	—	Class C Units	—

(a) Granted on February 21, 2008 in connection with the initial grants under the RT Investments equity-based incentive plan. The vesting measurement date, as set forth in the relevant subscription agreement, for these units is February 21, 2008. The Class B non-voting equity units of RT Investments time vest over 48 months and the Class C non-voting equity units of RT Investments vest annually for 34 months based on certain performance conditions and/or investment performance conditions being met or achieved and, in all cases, assuming continued employment, as explained in more detail above, under "Compensation Discussion and Analysis—Long-Term Equity Incentives."

(b) Units granted on March 1, 2011 with a vesting measurement date, as set forth in the relevant subscription agreement. The Class B non-voting equity units of RT Investments time vest over 46 months and the Class C non-voting equity units of RT Investments vest annually for 36 months based on certain performance conditions and/or investment performance conditions being met or achieved and, in all cases, assuming continued employment, as explained in more detail above, under "Compensation Discussion and Analysis—Long-Term Equity Incentives."

(c) Payout value represents fair market value determined as of fiscal year-end, which is $5.49 per Class B non-voting equity unit of RT Investments and $4.88 per Class C non-voting equity unit of RT Investments.

Option Exercises and Stock Vested

No options were issued, outstanding or exercised during fiscal 2011. For purposes of this disclosure item, no units were vested during fiscal 2011 such that value was realized, as the Company could repurchase at cost the units of any executive who terminated his or her employment voluntarily during fiscal 2011. However, if an executive officer were terminated without cause or resigned for good reason as of the last day of the fiscal year, he or she would be entitled to receive proceeds for a portion of his or her units. See "Compensation Discussion and Analysis—Treatment of Equity Interests in Radiation Therapy Services Holdings, Inc." below.

Pension Benefits

The Company has no pension plans.

Nonqualified Deferred Compensation

The Company does maintain a nonqualified deferred compensation plans. None of the named executives participated in the nonqualified deferred compensation plan in 2011.

Employment Agreements

Executive and Physician Employment Agreements with Daniel E. Dosoretz, M.D.

Executive Employment Agreement. We have entered into an Executive Employment Agreement, dated effective as of February 21, 2008, with Daniel E. Dosoretz, M.D., pursuant to which Dr. Dosoretz serves as our President and Chief Executive Officer. The employment term is a five-year term with automatic two-year extensions thereafter unless either party provides the other 120 days' prior written notice of its intention not to renew the employment agreement.

Dr. Dosoretz is currently entitled to receive an annual base salary of $1,500,000 and entitled to such increases in his annual base salary as may be determined by the Company's board of directors or compensation committee from time to time. With respect to the 2010 fiscal year and each full fiscal year during the employment term, Dr. Dosoretz is also eligible to earn an annual cash incentive payment of not less than $1,500,000, the actual amount of the bonus to be determined by the Company's board of directors pursuant to a bonus plan based on factors including, without limitation, the Company's achievement of PF Adjusted EBITDA and net debt targets. PF Adjusted EBITDA also includes certain adjustments, such as loss on extinguishment of debt, non-cash impairment losses and gains/losses on disposal of assets, minority interest, equity-based compensation, employee severance and other costs, acquisition costs, management fee to Vestar, adjustment related to sale-leaseback accounting, litigation expenses, non-cash rent expense and other adjustments.

Dr. Dosoretz is also entitled to participate in our employee benefit plans on the same basis as those benefits are generally made available to our other officers. Also, Dr. Dosoretz shall be entitled to use the Company's corporate jet in a manner consistent with past practice, and in addition to use of the plane in connection with the conduct of business on behalf of the Company, he is entitled to 200 hours of usage per year for personal use. We have also agreed to indemnify Dr. Dosoretz in connection with his capacity as our director and officer.

If Dr. Dosoretz resigns or otherwise voluntarily terminates his employment and the termination is not for good reason during the term of the agreement, he will be entitled to receive his base salary accrued and unpaid through the date of termination and his earned and unpaid annual cash incentive payment, if any, for the fiscal year prior to the termination date. Dr. Dosoretz shall also receive any nonforfeitable benefits already earned and payable to him under the terms of any deferred compensation, incentive or other benefit plan maintained by the Company, payable in accordance with the terms of the applicable plan (all amounts in this section are referred to as "Accrued Compensation").

If Dr. Dosoretz's employment is terminated by us without "cause" (as defined in his employment agreement) or by Dr. Dosoretz for "good reason" (as defined in his employment agreement), subject to his execution of a release of claims against us and his continued compliance with the restrictive covenants described below, and in addition to the payment of Accrued Compensation, the Company is obligated to make monthly payments to Dr. Dosoretz for a period of 24 months after his termination date. Each monthly payment shall be equal to $\frac{1}{12}^{th}$ of the sum of (i) Dr. Dosoretz's annual base salary, as in effect at the termination date, plus (ii) the amount equal to the sum of his bonuses for the three prior years divided by three. Dr. Dosoretz shall also be permitted to continue participation at the Company's expense in all benefit and insurance plans, coverage and programs for one year in which he was participating prior to the termination date.

If Dr. Dosoretz's employment terminates due to a "disability" (as defined in his employment agreement), he will be entitled to receive the Accrued Compensation and any other disability benefits payable pursuant to any long-term disability plan or other disability program or insurance policies maintained or provided by the Company. If Dr. Dosoretz dies during the term of his employment term, the Company shall pay to his estate a lump sum payment equal to the sum of (i) his Accrued

Compensation and (ii) the board of director's good faith estimated annual cash incentive payment for the fiscal year in which the death occurs (on a pro rate basis for the number whole or partial months in the fiscal year in which the death occurs through the date of death) based on the performance of the Company at the time of his death. In addition, the death benefits payable pursuant to any retirement, deferred compensation or other employee benefit plan maintained by the Company shall be paid to the beneficiary designated by Dr. Dosoretz in accordance with the terms of the applicable plan.

Dr. Dosoretz' Executive Employment Agreement also provides that if his Physician Employment Agreement is terminated for any reason, but his Executive Employment Agreement is not, Dr. Dosoretz' annual base salary under the Executive Employment Agreement shall be increased to $2,000,000.

Dr. Dosoretz is also subject to a covenant not to disclose our confidential information during his employment term, and at all times during his employment term and ending on the later of (i) the fifth anniversary of the Executive Employment Agreement and (ii) three years after his termination date, Dr. Dosoretz covenants not to compete with us, not to interfere or disrupt the relationships we have with any joint venture party, any patient, referral source, supplier or other person having a business relationship with the Company, not to solicit or hire any of our employees and not to publish or make any disparaging statements about us or any of our directors, officers or employees. If Dr. Dosoretz breaches or threatens to breach these covenants, the Company shall be entitled to temporary and injunctive relief, including temporary restraining orders, preliminary injunctions and permanent injunctions, to enforce such provisions in any action or proceeding instituted in any court in the State of Florida having subject matter jurisdiction. The provision with respect to injunctive relief shall not, however, diminish the Company's right to claims and recover damages.

Physician Employment Agreement. In addition, we have entered into a Physician Employment Agreement, dated as of February 21, 2008, with Dr. Dosoretz, pursuant to which Dr. Dosoretz shall provide medical services as a radiation oncologist at such locations as are mutually agreed. The employment term is a five-year term with automatic two-year extensions thereafter unless either party provides the other 120 days' prior written notice of its intention not to renew the employment agreement. For services rendered under the Physician Employment Agreement, Dr. Dosoretz shall receive an annual base salary of $500,000, and the Company shall be obligated to pay all medical malpractice insurance premiums during employment and any "tail" coverage premiums after termination or expiration of this agreement.

Dr. Dosoretz may voluntarily terminate this agreement prior to the end of the term with or without giving notice and the Company may terminate this agreement without cause at any time. The Company may terminate the agreement due to a "disability" (as defined in the agreement) and the agreement will automatically terminate upon Dr. Dosoretz's death. If the Executive Employment Agreement is terminated for any reason, the Company shall have the right, but not the obligation to terminate the Physician Employment Agreement, without any liability or obligation to him, other than any Accrued Compensation. If the Executive Employment Agreement is terminated for any reason, but the Physician Employment Agreement is not terminated, the Physician Employment Agreement shall remain in full force and effect, except that (i) Dr. Dosoretz's base salary shall be increased to $1,500,000; (ii) Dr. Dosoretz shall be obligated to work five days per week rather than up to two days per week as currently contemplated under the Physician Employment Agreement, and (iii) Dr. Dosoretz shall be eligible to participate in such other bonus and benefit plans afforded other senior physicians of the Company and receive comparable fringe benefits to such other senior physicians.

Dr. Dosoretz is also subject to covenants not to compete under the Physician Employment Agreement whereby in the event of the termination of this agreement for any reason, Dr. Dosoretz agrees, with certain exceptions, not to directly or indirectly engage in the practice of radiation therapy

or oncology, or otherwise compete with us (as defined in the agreement) for a period beginning on the date of the Physician Employment Agreement and ending on the later of (i) the fifth anniversary of the Physician Employment Agreement and (ii) three years after his termination date.

Executive Employment Agreement with Joseph M. Garcia

We have entered into an executive employment agreement, dated effective as of March 1, 2011, with Joseph M. Garcia, pursuant to which Mr. Garcia serves as Chief Operating Officer. The employment term is a three-year term beginning February 7, 2011 with automatic two-year extensions thereafter unless either party provides the other 120 days' prior written notice of its intention not to renew the employment agreement.

Mr. Garcia is currently entitled to receive an annual base salary of $400,000 and entitled to such increases in his annual base salary as may be determined by the Company's board of directors or compensation committee from time to time. With respect to the 2011 fiscal year and each full fiscal year during the employment term, Mr. Garcia is also eligible to earn an annual cash incentive payment of up to 60% of his base salary, the actual amount of the bonus to be determined by the Company's board of directors pursuant to a bonus plan based on factors including, without limitation, the Company's PF Adjusted EBITDA and net debt targets. Mr. Garcia is also entitled to participate in our employee benefit plans on the same basis as those benefits are generally made available to our other officers. We have also agreed to indemnify Mr. Garcia in connection with his capacity as an officer.

If Mr. Garcia's employment is terminated by us during the term of the agreement, he is entitled to his Accrued Compensation.

If Mr. Garcia's employment is terminated by us without "cause" (as defined in his employment agreement) or by Mr. Garcia for "good reason" (as defined in his employment agreement), subject to his execution of a release of claims against us and his continued compliance with the restrictive covenants described below, and in addition to the payment of the Accrued Compensation, the Company is obligated to make monthly payments to Mr. Garcia for a period of 12 months after his termination date. Each monthly payment shall be equal to $\frac{1}{12}^{th}$ of Mr. Garcia's annual base salary as in effect at the termination date; provided that payments that otherwise would have been made during the 60 day period after the termination date shall be made on the first payroll period after the 60th day following the termination date and shall include payment of any amounts that would have otherwise be due prior thereto.

If Mr. Garcia resigns or voluntarily terminates the agreement without "good reason", he shall be entitled to receive his Accrued Compensation.

If Mr. Garcia's employment terminates due to "disability" (as defined in his employment agreement), he will be entitled to receive the Accrued Compensation and any other disability benefits payable pursuant to any long-term disability plan or other disability program or insurance policies maintained or provided by the Company. If Mr. Garcia dies during the term of his employment term, the Company shall pay to his estate a lump sum payment equal to the sum of (i) his Accrued Compensation and (ii) the estimated annual cash incentive payment for the fiscal year in which the death occurs (on a pro rate basis for the number whole or partial months in the fiscal year in which the death occurs through the date of death). In addition, the death benefits payable pursuant to any retirement, deferred compensation or other employee benefit plan maintained by the Company shall be paid to the beneficiary designated by Mr. Garcia in accordance with the terms of the applicable plan.

Mr. Garcia is also subject to a covenant not to disclose our confidential information during his employment term, and at all times during his employment term and ending 18 months after his termination date, Mr. Garcia covenants not to compete with us, not to interfere or disrupt the relationships we have with any joint venture party, any patient, referral source, supplier or other person

having a business relationship with the Company, not to solicit or hire any of our employees and not to publish or make any disparaging statements about us or any of our directors, officers or employees. If Mr. Garcia breaches or threatens to breach these covenants, the Company shall be entitled to temporary and injunctive relief, including temporary restraining orders, preliminary injunctions and permanent injunctions, to enforce such provisions in any action or proceeding instituted in any court in the State of Florida having subject matter jurisdiction. The provision with respect to injunctive relief shall not, however, diminish the Company's right to claims and recover damages.

Physician Employment Agreement with Constantine A. Mantz, M.D.

We have entered into a physician employment agreement with Constantine A. Mantz, dated effective as of July 1, 2003 and as amended, pursuant to which Dr. Mantz serves as our Senior Vice President of Clinical Operations and provides medical services as a radiation oncologist. The employment term commenced on July 1, 2003 and is a five-year term with automatic one-year extensions thereafter unless either party provides the other 90 days' prior written notice of its intention not to renew the employment agreement. Dr. Mantz is currently entitled to receive an annual base salary of $1,100,000 and the Company shall be obligated to pay all medical malpractice insurance premiums during employment and any "tail" coverage premiums after termination or expiration of this agreement if Dr. Mantz's employment is terminated without cause, or due to death or disability. Further, during Dr. Mantz's employment, the Company will provide basic hospital and major medical insurance coverage to him to the extent obtainable with coverage amounts as the Company shall in its sole discretion determine and subject to the limitations and restrictions of the Company's group health plan.

In addition, Dr. Mantz is entitled to receive an annual production incentive bonus of up to $1,000,000 based on 22.5% of the collections of professional fees (as defined) greater than $1,025,000 with respect to the Company's Lee and Monroe County, Florida radiation oncology centers and certain other ancillary services provided in the Lee County, Florida local market.

Dr. Mantz and the Company may terminate this agreement prior to the end of the term by giving 90 days notice. If an event of termination occurs for any reason, Dr. Mantz shall be entitled to (i) receive his Accrued Compensation determined as of the effective date of termination and not theretofore paid and (ii) receive or continue to receive benefits due or payable under any pension or profit sharing plan and any disability, medical and life insurance plans maintained by the Company.

Dr. Mantz is also subject to a covenant not to disclose our confidential information during his employment term and at all times during his employment term and ending two years after his termination date, Dr. Mantz is agrees (i) not to practice radiation oncology at any center in Lee, Collier or Charlotte County, Florida or at those hospitals in Lee, Collier or Charlotte County, Florida where physicians employed by the Company or an affiliate of the Company are, at the time of such termination, practicing radiation oncology, and (ii) not to solicit or hire any of our employees.

Executive Employment Agreement with Kerrin E. Gillespie

We had entered into an executive employment agreement, dated effective as of February 8, 2010, with Kerrin E. Gillespie, pursuant to which Mr. Gillespie previously served as Senior Vice President and Chief Financial Officer. The employment term was a three-year term beginning March 15, 2010 with automatic two-year extensions thereafter unless either party provides the other 120 days' prior written notice of its intention not to renew the employment agreement.

Mr. Gillespie was entitled to receive an annual base salary of $400,000 and was entitled to such increases in his annual base salary as may be determined by the Company's board of directors or compensation committee from time to time. With respect to the 2010 fiscal year and each full fiscal year during the employment term, Gillespie is also eligible to earn an annual cash incentive payment of

up to 60% of his base salary, the actual amount of the bonus to be determined by the Company's board of directors pursuant to a bonus plan based on factors including, without limitation, the Company's PF Adjusted EBITDA and net debt targets. Mr. Gillespie was also entitled to participate in our employee benefit plans on the same basis as those benefits are generally made available to our other officers. We have also agreed to indemnify Mr. Gillespie in connection with his capacity as an officer.

Effective May 16, 2011, Mr. Gillespie resigned without "good reason", and was entitled to receive his Accrued Compensation.

Mr. Gillespie is also subject to a covenant not to disclose our confidential information during his employment term, and at all times during his employment term and ending 18 months after his termination date, Mr. Gillespie covenants not to compete with us, not to interfere or disrupt the relationships we have with any joint venture party, any patient, referral source, supplier or other person having a business relationship with the Company, not to solicit or hire any of our employees and not to publish or make any disparaging statements about us or any of our directors, officers or employees. If Mr. Gillespie breaches or threatens to breach these covenants, the Company shall be entitled to temporary and injunctive relief, including temporary restraining orders, preliminary injunctions and permanent injunctions, to enforce such provisions in any action or proceeding instituted in any court in the State of Florida having subject matter jurisdiction. The provision with respect to injunctive relief shall not, however, diminish the Company's right to claims and recover damages.

Mr. Gillespie's employment ended on May 16, 2011.

Executive Employment Agreement with Norton L. Travis

We have entered into an executive employment agreement, dated effective as of February 21, 2008, with Norton L. Travis, pursuant to which Mr. Travis serves as our Executive Vice President and General Counsel. The employment term is a five-year term with automatic two-year extensions thereafter unless either party provides the other 120 days' prior written notice of its intention not to renew the employment agreement. On February 3, 2011, the employment agreement was amended to provide for a termination date of February 3, 2016 with automatic extensions thereafter unless either party provides the other 120 days prior written notice not to renew the agreement.

Mr. Travis is currently entitled to receive an annual base salary of $900,000 and entitled to such increases in his annual base salary as may be determined by the Company's board of directors or compensation committee from time to time. With respect to the 2010 fiscal year and each full fiscal year during the employment term, Mr. Travis is also eligible to earn an annual cash incentive payment of not less than $300,000, (as the Company's board of directors may, but not be obligated to adjust from time to time, the "Travis Target Bonus"), the actual amount of the bonus to be determined by the Company's board of directors pursuant to a bonus plan based on factors including, without limitation, the Company's PF Adjusted EBITDA and net debt targets. Mr. Travis is also entitled to participate in our employee benefit plans on the same basis as those benefits are generally made available to our other officers. We have also agreed to indemnify Mr. Travis in connection with his capacity as an officer.

If Mr. Travis' employment is terminated by us during the term of the agreement, he will be entitled to receive his Accrued Compensation.

If Mr. Travis' employment is terminated by us without "cause" (as defined in his employment agreement) or by Mr. Travis for "good reason" (as defined in his employment agreement), subject to his execution of a release of claims against us and his continued compliance with the restrictive covenants described below, and in addition to the payment of the Accrued Compensation, the Company is obligated to make monthly payments to Mr. Travis for a period of 24 months after his

termination date. Each monthly payment shall be equal to $\frac{1}{12}^{th}$ of the sum of (i) Mr. Travis' annual base salary, as in effect at the termination date, plus (ii) the Travis Target Bonus for the year immediately prior to the year during which termination occurs.

If Mr. Travis resigns or voluntarily terminates the agreement without "good reason", he will be entitled to receive his Accrued Compensation.

If Mr. Travis' employment terminates due to his "disability" (as defined in his employment agreement), he will be entitled to receive the Accrued Compensation and any other disability benefits payable pursuant to any long-term disability plan or other disability program or insurance policies maintained or provided by the Company. If Mr. Travis dies during the term of his employment term, the Company shall pay to his estate a lump sum payment equal to the sum of (i) his Accrued Compensation and (ii) the estimated annual cash incentive payment for the fiscal year in which the death occurs (on a pro rate basis for the number whole or partial months in the fiscal year in which the death occurs through the date of death). In addition, the death benefits payable pursuant to any retirement, deferred compensation or other employee benefit plan maintained by the Company shall be paid to the beneficiary designated by Mr. Travis in accordance with the terms of the applicable plan.

Mr. Travis is also subject to a covenant not to disclose our confidential information during his employment term, and at all times during his employment term and ending three years after his termination date, Mr. Travis covenants not to compete with us, not to interfere or disrupt the relationships we have with any joint venture party, any patient, referral source, supplier or other person having a business relationship with the Company, not to solicit or hire any of our employees and not to publish or make any disparaging statements about us or any of our directors, officers or employees. If Mr. Travis breaches or threatens to breach these covenants, the Company shall be entitled to temporary and injunctive relief, including temporary restraining orders, preliminary injunctions and permanent injunctions, to enforce such provisions in any action or proceeding instituted in any court in the State of Florida having subject matter jurisdiction. The provision with respect to injunctive relief shall not, however, diminish the Company's right to claims and recover damages.

Executive Employment Agreement with Bryan J. Carey

We are currently negotiating an executive employment agreement with Mr. Carey and he received $100,000 as remuneration in conjunction with his capacity of interim Chief Financial Officer. Mr. Carey does not and did not participate in the annual cash performance incentive bonus plan and did not receive any discretionary or other bonuses.

Potential Payments upon Termination

The following disclosure indicates the potential payments and benefits to which our named executive officers would be entitled upon termination of employment. All calculations are based on an assumed termination date of December 31, 2011. The disclosure below does not include payments and benefits to the extent they are provided generally to all salaried employees upon termination of employment and do not discriminate in scope, terms or operation in favor of the named executive officers. Potential payments upon termination attributable to Mr. Watson and Mr. Gillespie are not presented below since they did not receive any such payments as a result of his voluntarily termination of employment with the Company on August 31, 2009 and May 16, 2011, respectively. Potential payments upon termination attributable to Mr. Carey are not presented below since we did not enter into an employment agreement with Mr. Carey and he was not otherwise entitled to such termination payments or benefits.

Potential Payments to Each Named Executive Officer

Daniel E. Dosoretz, M.D., President and Chief Executive Officer(1)

Event	Cash Severance Lump Payment ($)	Cash Severance Payment Over Two Years ($)	Non-Equity Incentive Plan Compensation ($)	Medical & Dental Healthcare Benefits ($)	Total ($)
For cause or resignation without good reason	—	—	—	—	—
Involuntary termination without cause, resignation for good reason	—	4,200,000	600,000	18,000	4,818,000
Voluntary resignation	—	—	—	—	—
Disability or death(2)	600,000	—	—	—	600,000

(1) The potential payments and benefits upon termination of employment described above are pursuant to the terms of Dr. Dosoretz's Executive Employment Agreement.

(2) The executive or beneficiary shall be entitled to (a) disability benefits payable pursuant to any long-term disability plan or other disability program or insurance policies maintained or provided by the Company and (b) death benefits payable pursuant to any retirement, deferred compensation or other employee benefit plan maintained by the Company in accordance with the terms of the applicable plan or plans.

Joseph M. Garcia, Chief Operating Officer(1)

Event	Cash Severance Lump Payment ($)	Cash Severance Payment Over 18 Months ($)	Non-Equity Incentive Plan Compensation ($)	Medical & Dental Healthcare Benefits ($)	Total ($)
For cause or resignation without good reason	—	—	—	—	—
Involuntary termination without cause, resignation for good reason	—	600,000	200,000	—	800,000
Voluntary resignation	—	—	—	—	—
Disability or death(2)	200,000	—	—	—	200,000

(1) Mr. Garcia's employment commenced on February 7, 2011.

(2) The executive or beneficiary shall be entitled to (a) disability benefits payable pursuant to any long-term disability plan or other disability program or insurance policies maintained or provided by the Company and (b) death benefits payable pursuant to any retirement, deferred compensation or other employee benefit plan maintained by the Company in accordance with the terms of the applicable plan or plans.

Constantine A. Mantz, M.D., Senior Vice President of Clinical Operations

Event	Cash Severance Lump Payment ($)	Cash Severance Payment ($)	Non-Equity Incentive Plan Compensation ($)	Medical & Dental Healthcare Benefits ($)	Total ($)
For cause or resignation without good reason	—	—	—	—	—
Involuntary termination without cause, resignation for good reason	—	—	—	—	—
Voluntary resignation	—	—	—	—	—
Disability or death(1)	—	—	—	—	—

(1) The executive or beneficiary shall be entitled to (a) disability benefits payable pursuant to any long-term disability plan or other disability program or insurance policies maintained or provided by the Company and (b) death benefits payable pursuant to any retirement, deferred compensation or other employee benefit plan maintained by the Company in accordance with the terms of the applicable plan or plans.

Norton L. Travis, Executive Vice President and General Counsel

Event	Cash Severance Lump Payment ($)	Cash Severance Payment Over Two Years ($)	Non-Equity Incentive Plan Compensation ($)	Medical & Dental Healthcare Benefits ($)	Total ($)
For cause or resignation without good reason	—	—	—	—	—
Involuntary termination without cause, resignation for good reason	—	2,200,000	200,000	—	2,400,000
Voluntary resignation	—	—	—	—	—
Disability or death(1)	200,000	—	—	—	200,000

(1) The executive or beneficiary shall be entitled to (a) disability benefits payable pursuant to any long-term disability plan or other disability program or insurance policies maintained or provided by the Company and (b) death benefits payable pursuant to any retirement, deferred compensation or other employee benefit plan maintained by the Company in accordance with the terms of the applicable plan or plans.

Treatment of Equity Interests in RT Investments

Upon the termination of the executive's employment with the Company for any reason whatsoever, (a) all unvested Class B non-voting equity units of RT Investments held by the executive as of the termination date shall expire and be immediately forfeited and canceled in their entirety as of the termination date and (b) all vested Class B non-voting equity units of RT Investments held by the executive shall remain outstanding, except that if executive's employment is terminated by the Company for cause at any time or by the executive without good reason during the two year period following the grant date, or if executive engages in any non-compete activities prohibited under his employment agreement and as further defined in the Management Unit Subscription Agreement for Class B non-voting equity units of RT Investments and Class C non-voting equity units of RT Investments during the time that such activities are prohibited, then all Class B Units (whether vested or unvested) and all Class C non-voting equity units of RT Investments (whether vested or unvested) held by such

terminated executive shall expire and be immediately forfeited and canceled in their entirety as of the earlier of the termination date or the date executive engages in such prohibited activities.

Upon the termination of the executive's employment with the Company for any reason whatsoever, the Class C non-voting equity units of RT Investments held by the executive shall be treated as follows:

(i) if, as of the termination date, Vestar has not received cash distributions that results in a multiple of investment that is equal to two and one half times Vestar's total capital contributions (the "First Performance Hurdle"), then all of the Class C non-voting equity units of RT Investments held by the executive shall be immediately forfeited and canceled, except that any Class C non-voting equity units of RT Investments that have become vested shall remain outstanding;

(ii) if, as of the termination date, the First Performance Hurdle has been achieved but Vestar has not received cash distributions that results in a multiple of investment that is equal to three times Vestar's total capital contribution (the "Second Performance Hurdle"), than all Class C non-voting equity units of RT Investments held by the executive shall be immediately forfeited and canceled, except that any Class C non-voting equity units of RT Investments that have become vested shall remain outstanding; or

(iii) if, as of the termination date, the Second Performance Hurdle has been achieved, then all Class C non-voting equity units of RT Investments that have become vested shall remain outstanding.

Notwithstanding the above, if (i) the executive's employment with the Company is terminated for any reason other than (A) by the Company for cause or (B) by the executive without good reason during the two year period subsequent to the grant date of the Class C non-voting equity units of RT Investments and (ii) a sale of the Company occurs within six months following the termination date that results in Vestar receiving proceeds from such sale together with any distributions made at the same time or as or prior to the consummation of the sale, that would have resulted in the executive being entitled to retain a greater number of Class C non-voting equity units of RT Investments if the executive had remained employed by the Company through the date of the sale of the Company that the number of Units retained by the executive pursuant to the foregoing provisions, then (x) such additional Class C non-voting equity units of RT Investments shall be deemed to remain outstanding as of the time of the consummation of the sale of the Company, (y) the amount of any distributions by the Company that the executive shall be entitled to receive with respect to the Class C non-voting equity units of RT Investments held by the executive shall be governed by the applicable section of the Amended and Restated Limited Liability Company Agreement of Radiation Therapy Investments, LLC and give effect to such additional Class C non-voting equity units of RT Investments , and (z) the amount of the proceeds that the executive shall be entitled to receive with respect to the Class C non-voting equity units of RT Investments held by the executive in such sale of the Company shall be governed by the applicable sections of the Amended and Restated Securityholders Agreement described below. See "Certain Relationships and Related Party Transactions."

Further, if the executive's employment with the Company terminates for any reasons set forth in clauses (i), (ii) or (iii) below prior to the Company's initial public offering (in any event excluding termination of employment by retirement prior the Company's initial public offering), the Company shall have the right and option to purchase for a period of 90 days following the termination date, and each member of the executive group shall be required to sell to the Company, any of all of such Units then held by such member of the executive group, at a price per unit equal to fair market value, as defined in the Management Unit Subscription Agreement (measured as of the later of (x) the termination date and (y) the six month anniversary of the grant date) of such vested Class B non-voting equity unit or vested Class C non-voting equity unit, as applicable provided that the Company's board of directors shall have the right, in its sole discretion, to increase the purchase price as set forth above

if the executive's active employment with the Company is terminated due to: (i) the disability or death of the executive; (ii) (A) by the Company without cause or (B) by the executive with good reason; or (iii) any other reason not set forth in (i) or (ii) above after the second anniversary of the grant date.

Compensation Committee Report

The Compensation Committee has reviewed and discussed the Compensation Discussion and Analysis with management. Based upon this review and discussion, the Compensation Committee recommended to the Company's board of directors that the Compensation Discussion and Analysis be included in this Registration Statement.

Submitted by the Compensation Committee of the Company's board of directors:

James L. Elrod, Jr. (Chair)
Howard M. Sheridan, M.D.

Directors Compensation

The following tables provide information concerning certain of our employees who are not named executive officers but who serve as a director on the Company's board of directors. We do not provide any remuneration to the members of the Company's board of directors other than to the directors listed below and the compensatory arrangements with certain of our directors designated as a named executive office other than for director services. See "Executive Compensation" and "Certain Relationships and Related Party Transactions." Shares and stock options are not included in this table because none were issued during fiscal 2011 and none were outstanding at fiscal year-end. Further, changes in pension value and nonqualified deferred compensation earnings are also not included in this table because the Company does not maintain any pension plans and the Directors did not participate in our nonqualified deferred compensation plans.

	Fees Earned or Paid in Cash($)	Stock Award($)	Non-Equity Incentive Plan Compensation($)(1)	All Other Annual Compensation($)	Total($)
Howard M. Sheridan, M.D.	—	—	—	305,188(2)	305,188
James H. Rubenstein, M.D. ...	—	—	—	675,194(3)	675,194

(1) Dr. Rubenstein participates in the Company's annual cash incentive bonus award plan. See "Executive Compensation." For fiscal year 2011, Dr. Rubenstein was eligible to earn an annual cash performance incentive bonus award with a target bonus amount not less than $400,000 pursuant to a bonus plan based on factors including, without limitation, the Company's achievement of PF Adjusted EBITDA and net debt targets. The relative weight of each factor in determining the cash performance incentive bonus award was determined by the Company's board of directors. PF Adjusted EBITDA also includes certain adjustments, such as loss on extinguishment of debt, non-cash impairment losses and gains/losses on disposal of assets, minority interest, equity-based compensation, employee severance and other costs, acquisition costs, management fee to Vestar, adjustment related to sale-leaseback accounting, litigation expenses, non-cash rent expense and other adjustments. For fiscal year 2011, the Company's board of directors assigned a 60% weighting to PF Adjusted EBITDA performance measure, a 20% weighting to net debt performance measure to encourage management to focus more on making long-term investments to grow our business, and a 20% weighting to achievement of specified objectives. The specified objectives were achieved in 2010 in addition to the achievement of the PF Adjusted EBITDA and net debt targets at the minimum levels.

(2) We entered into an Executive Employment Agreement with Dr. Sheridan in connection with the Merger under which Dr. Sheridan provides corporate executive services and support in such areas

as strategic planning, mergers and acquisitions, and physician, payor and hospital relationships. This agreement provides for a base salary of $300,000 and a performance incentive bonus at the discretion of the Company's board of directors, or it's Compensation Committee. Compensation associated with the personal use of the Company's corporate aircraft in 2011 of $4,807 and life insurance premiums paid by the Company in 2011 of $381. Dr. Sheridan did not receive a discretionary bonus in fiscal 2011.

(3) We entered into an Executive Employment Agreement with Dr. Rubenstein in conjunction with the Merger in which Dr. Rubenstein serves as Secretary and Medical Director. This agreement provides for a base salary of $400,000 and participation in the annual cash performance incentive bonus award plan as described above. In addition, we entered into a Physician Employment Agreement with Dr. Rubenstein also in connection with the Merger which provided for an annual base salary of $300,000. The Physician Employment Agreement was amended in February 2010, to reduce the annual base salary to $200,000. In 2011, Dr. Rubenstein received $25,065 pursuant to a production and ancillary bonus arrangement, a $50,000 discretionary bonus for his dedicated services in the field of radiation oncology and life insurance premiums paid by the Company in 2011 of $129.

In the event that either the Physician Employment Agreement or Executive Employment Agreement is terminated for any reason, Dr. Rubenstein's annual base salary under the respective continuing agreement shall be increased to $700,000.

Grants of Plan-Based Awards in Fiscal 2011

The following table provides supplemental information relating to grants of plan-based awards to our directors in fiscal 2011.

		Payout Levels Under Non-Equity Incentive Plan Awards			Payout Levels Under Equity Incentive Plan Awards			All Other Stock Awards: Number of Shares of Stock or Units(#)
	Grant Date(1)	Minimum ($)	Target ($)	Maximum ($)	Minimum ($)	Target ($)	Maximum ($)	
Howard M. Sheridan, M.D. . .	—	—	—	—	—	—	—	—
James H. Rubenstein, M.D. . .	—	80,000	400,000	800,000	—	—	—	—

(1) Thresholds under non-equity performance incentive bonus plan are determined annually by the Company's board of directors. Amounts set forth in this table exclude the achievement of specified objectives, which if achieved could provide an additional 20% bonus based on the director's base salary.

Outstanding Equity Awards at 2011 Fiscal-Year End

The following table provides information regarding outstanding equity awards held by our directors as of the end of fiscal 2011. Shares and stock options are not included in this table because none were issued during fiscal 2011 and none were outstanding at fiscal year-end.

	Stock Awards			Equity Incentive Plan Awards
	Number of Shares or Units of Stock That Have Not Vested(#)	Market Value of Shares or Units of Stock That Have Not Vested($)(b)	Number of Unearned Shares, Units or Other Rights That Have Not Vested(#)	Market or Payout Value of Unearned Shares, Units or Other Rights That Have Not Vested($)(b)
Howard M. Sheridan, M.D.	1,053 Class B Units(a)	5,778	9,678 Class C Units(a)	47,231
James H. Rubenstein, M.D.	3,158 Class B Units(a)	17,335	29,035 Class C Units(a)	141,693

(a) Granted on February 21, 2008 in connection with the initial grants under the Company's equity-based incentive plan. The vesting measurement date, as set forth in the relevant subscription agreement, for these units is February 21, 2008. The Class B non-voting equity units of RT Investments vest over 48 months and the Class C non-voting equity units of RT Investments vest annually for 34 months based on certain performance conditions and/or market conditions being met or achieved and, in all cases, assuming continued employment, as explained in more detail above, under "Compensation Discussion and Analysis—Long-Term Equity Incentives."

(b) Payout value represents fair market value determined as of fiscal year-end, which is $5.49 per Class B non-voting equity unit of RT Investments and $4.88 per Class C non-voting equity unit of RT Investments.

As of December 31, 2011, each director held the following total numbers of units of RT Investments (including those not set forth above because they are vested):

- Dr. Sheridan held 3,158 Class B non-voting equity units and 1,210 Class C non-voting equity units; and
- Dr. Rubenstein held 9,473 Class B non-voting equity units and 3,629 Class C non-voting equity units.

Option Exercises and Stock Vested

No options were issued, outstanding or exercised during fiscal 2011. For purposes of this disclosure item, no units were vested during fiscal 2011 such that value was realized, as the Company could repurchase at cost the units of any executive or director who terminated his or her employment voluntarily during fiscal 2011. However, if an executive or director were terminated without cause or resigned for good reason as of the last day of the fiscal year, he or she would be entitled to receive proceeds for a portion of his or her units. See "Compensation Discussion and Analysis—Treatment of Equity Interests in Radiation Therapy Services Holdings, Inc."

Employment Agreements

Executive and Physician Employment Agreements with James H. Rubenstein, M.D.

Executive Employment Agreement

We have entered into an Executive Employment Agreement, dated effective as of February 21, 2008, with James H. Rubenstein, M.D., pursuant to which Dr. Rubenstein serves as our Secretary and Medical Director. The employment term is a three-year term with automatic two-year extensions thereafter unless either party provides the other 120 days' prior written notice of its intention not to renew the employment agreement.

Dr. Rubenstein is currently entitled to receive an annual base salary of $400,000 and entitled to such increases in his annual base salary as may be determined by the Company's board of directors or

compensation committee from time to time. With respect to the 2011 fiscal year and each full fiscal year during the employment term, Dr. Rubenstein is also eligible to earn an annual cash incentive payment of not less than $400,000, (as the Company's board of directors may, but not be obligated to adjust from time to time, the "Rubenstein Target Bonus"), the actual amount of the bonus to be determined by the Company's board of directors pursuant to a bonus plan based on factors including, without limitation, the Company's achievement of PF Adjusted EBITDA and net debt targets.

Dr. Rubenstein is also entitled to participate in our employee benefit plans on the same basis as those benefits are generally made available to our other officers. We have also agreed to indemnify Dr. Rubenstein in connection with his capacity as a director.

If Dr. Rubenstein resigns or otherwise voluntarily terminates his employment and the termination is not for good reason during the term of the agreement, he will be entitled to receive his base salary accrued and unpaid through the date of termination and his earned and unpaid annual cash incentive payment, if any, for the fiscal year prior to the termination date. Dr. Rubenstein shall also receive any Accrued Compensation.

If Dr. Rubenstein's employment is terminated by us without "cause" (as defined in his employment agreement) or by Dr. Rubenstein for "good reason" (as defined in his employment agreement), subject to his execution of a release of claims against us and his continued compliance with the restrictive covenants described below, and in addition to the payment of Accrued Compensation, the Company is obligated to make monthly payments to Dr. Rubenstein for a period of 24 months after his termination date. Each monthly payment shall be equal to $1/12^{th}$ of the sum of (i) Dr. Rubenstein's annual base salary, as in effect at the termination date, plus (ii) the Rubenstein Target Bonus for the year immediately prior to the year during which termination occurs. Dr. Rubenstein shall also be permitted to continue participation at the Company's expense in all benefit and insurance plans, coverage and programs for one year in which he was participating prior to the termination date.

If Dr. Rubenstein's employment terminates due to a "disability" (as defined in his employment agreement), he will be entitled to receive the Accrued Compensation and any other disability benefits payable pursuant to any long-term disability plan or other disability program or insurance policies maintained or provided by the Company. If Dr. Rubenstein dies during the term of his employment term, the Company shall pay to his estate a lump sum payment equal to the sum of (i) his Accrued Compensation and (ii) the board of director's good faith estimated annual cash incentive payment for the fiscal year in which the death occurs (on a pro rate basis for the number whole or partial months in the fiscal year in which the death occurs through the date of death) based on the performance of the Company at the time of his death. In addition, the death benefits payable pursuant to any retirement, deferred compensation or other employee benefit plan maintained by the Company shall be paid to the beneficiary designated by Dr. Rubenstein in accordance with the terms of the applicable plan.

Dr. Rubenstein' Executive Employment Agreement also provides that if his Physician Employment Agreement is terminated for any reason, but his Executive Employment Agreement is not, Dr. Rubenstein' annual base salary under the Executive Employment Agreement shall be increased to $700,000.

Dr. Rubenstein is also subject to a covenant not to disclose our confidential information during his employment term, and at all times during his employment term and ending on the later of (i) the fifth anniversary of the Executive Employment Agreement and (ii) three years after his termination date, Dr. Rubenstein covenants not to compete with us, not to interfere or disrupt the relationships we have with any joint venture party, any patient, referral source, supplier or other person having a business relationship with the Company, not to solicit or hire any of our employees and not to publish or make any disparaging statements about us or any of our directors, officers or employees. If Dr. Rubenstein breaches or threatens to breach these covenants, the Company shall be entitled to temporary and injunctive relief, including temporary restraining orders, preliminary injunctions and permanent

injunctions, to enforce such provisions in any action or proceeding instituted in any court in the State of Florida having subject matter jurisdiction. The provision with respect to injunctive relief shall not, however, diminish the Company's right to claims and recover damages.

Physician Employment Agreement

In addition, we have entered into a Physician Employment Agreement, dated as of February 21, 2008 and as amended, with Dr. Rubenstein, pursuant to which Dr. Rubenstein shall provide medical services as a radiation oncologist at such locations as are mutually agreed. The employment term is a three-year term with automatic two-year extensions thereafter unless either party provides the other 120 days' prior written notice of its intention not to renew the employment agreement. For services rendered under the Physician Employment Agreement, Dr. Rubenstein shall receive an annual base salary of $200,000, and the Company shall be obligated to pay all medical malpractice insurance premiums during employment and any "tail" coverage premiums after termination or expiration of this agreement.

Dr. Rubenstein may voluntarily terminate this agreement prior to the end of the term with or without giving notice and the Company may terminate this agreement without cause at any time. The Company may terminate the agreement due to a "disability" (as defined in the agreement) and the agreement will automatically terminate upon Dr. Rubenstein's death. If the Executive Employment Agreement is terminated for any reason, the Company shall have the right, but not the obligation to terminate the Physician Employment Agreement, without any liability or obligation to him, other than any Accrued Compensation. If the Executive Employment Agreement is terminated for any reason, but the Physician Employment Agreement is not terminated, the Physician Employment Agreement shall remain in full force and effect, except that (i) Dr. Rubenstein's base salary shall be increased to $700,000; (ii) Dr. Rubenstein shall be obligated to work five days per week rather than up to two days per week as currently contemplated under the Physician Employment Agreement, and (iii) Dr. Rubenstein shall be eligible to participate in such other bonus and benefit plans afforded other senior physicians of the Company and receive comparable fringe benefits to such other senior physicians.

Dr. Rubenstein is also subject to covenants not to compete under the Physician Employment Agreement whereby in the event of the termination of this agreement for any reason, Dr. Rubenstein agrees not to directly or indirectly engage in the practice of radiation therapy or oncology, or otherwise compete with us (as defined in the agreement) for a period beginning on the date of the Physician Employment Agreement and ending on the later of (i) the fifth anniversary of the Physician Employment Agreement and (ii) three years after his termination date.

Executive Employment Agreements with Howard M. Sheridan, M.D.

Executive Employment Agreement

We have entered into an Executive Employment Agreement, dated effective as of February 21, 2008, with James H. Sheridan, M.D., pursuant to which Dr. Sheridan provides corporate executive services and support in such areas as strategic planning, mergers and acquisitions, and physician, payor and hospital relationships. The employment term is a three-year term with automatic two-year extensions thereafter unless either party provides the other 120 days' prior written notice of its intention not to renew the employment agreement.

Dr. Sheridan is currently entitled to receive an annual base salary of $300,000 and entitled to such increases in his annual base salary as may be determined by the Company's board of directors or compensation committee from time to time. With respect to the 2011 fiscal year and each full fiscal year during the employment term, Dr. Sheridan is eligible to receive a performance incentive bonus at the discretion of the Company's board of directors, or it's Compensation Committee.

Dr. Sheridan is also entitled to use the Company's corporate jet in connection with the conduct of business on behalf of the Company and he is entitled to 25 hours of usage per year for personal use. We have also agreed to indemnify Dr. Sheridan in connection with his capacity as a director.

If Dr. Sheridan resigns or otherwise voluntarily terminates his employment and the termination is not for good reason during the term of the agreement, he will be entitled to receive his base salary accrued and unpaid through the date of termination and his earned and unpaid annual cash incentive payment, if any, for the fiscal year prior to the termination date. Dr. Sheridan shall also receive any Accrued Compensation.

If Dr. Sheridan's employment is terminated by us without "cause" (as defined in his employment agreement) or by Dr. Sheridan for "good reason" (as defined in his employment agreement), subject to his execution of a release of claims against us and his continued compliance with the restrictive covenants described below, and in addition to the payment of Accrued Compensation, the Company is obligated to make monthly payments to Dr. Sheridan for a period of 12 months after his termination date. Each monthly payment shall be equal to $1/12^{th}$ of the sum of (i) Dr. Sheridan's annual base salary, as in effect at the termination date, plus (ii) his bonus for the year immediately prior to the year during which termination occurs.

If Dr. Sheridan's employment terminates due to a "disability" (as defined in his employment agreement), he will be entitled to receive the Accrued Compensation and any other disability benefits payable pursuant to any long-term disability plan or other disability program or insurance policies maintained or provided by the Company. If Dr. Sheridan dies during the term of his employment term, the Company shall pay to his estate a lump sum payment equal to the sum of (i) his Accrued Compensation and (ii) the board of director's good faith estimated annual cash incentive payment for the fiscal year in which the death occurs (on a pro rate basis for the number whole or partial months in the fiscal year in which the death occurs through the date of death) based on the performance of the Company at the time of his death. In addition, the death benefits payable pursuant to any retirement, deferred compensation or other employee benefit plan maintained by the Company shall be paid to the beneficiary designated by Dr. Sheridan in accordance with the terms of the applicable plan.

Dr. Sheridan is also subject to a covenant not to disclose our confidential information during his employment term, and at all times during his employment term and ending on the later of (i) the fifth anniversary of the Executive Employment Agreement and (ii) three years after his termination date, Dr. Sheridan covenants not to compete with us, not to interfere or disrupt the relationships we have with any joint venture party, any patient, referral source, supplier or other person having a business relationship with the Company, not to solicit or hire any of our employees and not to publish or make any disparaging statements about us or any of our directors, officers or employees. If Dr. Sheridan breaches or threatens to breach these covenants, the Company shall be entitled to temporary and injunctive relief, including temporary restraining orders, preliminary injunctions and permanent injunctions, to enforce such provisions in any action or proceeding instituted in any court in the State of Florida having subject matter jurisdiction. The provision with respect to injunctive relief shall not, however, diminish the Company's right to claims and recover damages.

Potential Payments upon Termination

The following disclosure indicates the potential payments and benefits to which our directors would be entitled upon termination of employment. All calculations are based on an assumed termination date of December 31, 2011. The disclosure below does not include payments and benefits to the extent they are provided generally to all salaried employees upon termination of employment and do not discriminate in scope, terms or operation in favor of the directors.

Potential Payments to Each Director

James H. Rubenstein, M.D., Director, Secretary and Medical Officer(1)

Event	Cash Severance Lump Payment ($)	Cash Severance Payment Over One Year ($)	Non-Equity Incentive Plan Compensation ($)	Medical & Dental Healthcare Benefits ($)	Total ($)
For cause or resignation without good reason	—	—	—	—	—
Involuntary termination without cause, resignation for good reason	—	800,000	—	—	800,000
Voluntary resignation	—	—	—	—	—
Disability or death(2)	—	—	—	—	—

(1) The potential payments and benefits upon termination of employment described above are pursuant to the terms of Dr. Rubenstein's Executive Employment Agreement.

(2) The executive or beneficiary shall be entitled to (a) disability benefits payable pursuant to any long-term disability plan or other disability program or insurance policies maintained or provided by the Company and (b) death benefits payable pursuant to any retirement, deferred compensation or other employee benefit plan maintained by the Company in accordance with the terms of the applicable plan or plans.

Howard M. Sheridan, M.D., Director

Event	Cash Severance Lump Payment ($)	Cash Severance Payment Over One Year ($)	Non-Equity Incentive Plan Compensation ($)	Medical & Dental Healthcare Benefits ($)	Total ($)
For cause or resignation without good reason	—	—	—	—	—
Involuntary termination without cause, resignation for good reason	—	300,000	—	—	300,000
Voluntary resignation	—	—	—	—	—
Disability or death(1)	—	—	—	—	—

(1) The executive or beneficiary shall be entitled to (a) disability benefits payable pursuant to any long-term disability plan or other disability program or insurance policies maintained or provided by the Company and (b) death benefits payable pursuant to any retirement, deferred compensation or other employee benefit plan maintained by the Company in accordance with the terms of the applicable plan or plans.

Treatment of Equity Interests in RT Investments

Upon the termination of the director's employment with the Company for any reason whatsoever, (a) all unvested Class B non-voting equity units of RT Investments held by the director as of the termination date shall expire and be immediately forfeited and canceled in their entirety as of the termination date and (b) all vested Class B non-voting equity units of RT Investments held by the director shall remain outstanding, except that if director's employment is terminated by the Company for cause at any time or by the director without good reason during the two year period following the grant date, or if director engages in any non-compete activities prohibited under his employment agreement and as further defined in the Management Unit Subscription Agreement for Class B

non-voting equity units of RT Investments and Class C non-voting equity units of RT Investments during the time that such activities are prohibited, then all Class B non-voting equity units of RT Investments (whether vested or unvested) and all Class C non-voting equity units of RT Investments (whether vested or unvested) held by such terminated director shall expire and be immediately forfeited and canceled in their entirety as of the earlier of the termination date or the date director engages in such prohibited activities.

Upon the termination of the director's employment with the Company for any reason whatsoever, the Class C non-voting equity units of RT Investments held by the director shall be treated as follows:

(i) if, as of the termination date, Vestar has not received cash distributions that results in the First Performance Hurdle, then all of the Class C non-voting equity units of RT Investments held by the director shall be immediately forfeited and canceled, except that any Class C non-voting equity units of RT Investments that have become vested shall remain outstanding;

(ii) if, as of the termination date, the First Performance Hurdle has been achieved but Vestar has not received cash distributions that results in the Second Performance Hurdle, than all Class C non-voting equity units of RT Investments held by the director shall be immediately forfeited and canceled, except that any Class C non-voting equity units of RT Investments that have become vested shall remain outstanding; or

(iii) if, as of the termination date, the Second Performance Hurdle has been achieved, then all Class C non-voting equity units of RT Investments that have become vested shall remain outstanding.

Notwithstanding the above, if (i) the director's employment with the Company is terminated for any reason other than (A) by the Company for cause or (B) by the director without good reason during the two year period subsequent to the grant date of the Class C non-voting equity units of RT Investments and (ii) a sale of the Company occurs within six months following the termination date that results in Vestar receiving proceeds from such sale together with any distributions made at the same time or as or prior to the consummation of the sale, that would have resulted in the director being entitled to retain a greater number of Class C non-voting equity units of RT Investments if the director had remained employed by the Company through the date of the sale of the Company that the number of Units retained by the director pursuant to the foregoing provisions, then (x) such additional Class C non-voting equity units of RT Investments shall be deemed to remain outstanding as of the time of the consummation of the sale of the Company, (y) the amount of any distributions by the Company that the director shall be entitled to receive with respect to the Class C non-voting equity units of RT Investments held by the director shall be governed by the applicable section of the Amended and Restated Limited Liability Company Agreement of Radiation Therapy Investments, LLC and give effect to such additional Class C non-voting equity units of RT Investments, and (z) the amount of the proceeds that the director shall be entitled to receive with respect to the Class C non-voting equity units of RT Investments held by the director in such sale of the Company shall be governed by the applicable sections of the Securityholders Agreement dated as of February 21, 2008 among Vestar, the management investors and the Company, as amended or supplemented thereafter from time to time.

Further, if the director's employment with the Company terminates for any reasons set forth in clauses (i), (ii) or (iii) below prior to the Company's initial public offering (in any event excluding termination of employment by retirement prior the Company's initial public offering), the Company shall have the right and option to purchase for a period of 90 days following the termination date, and each member of the executive and director group shall be required to sell to the Company, any of all of such Units then held by such member of the executive and director group, at a price per unit equal to fair market value, as defined in the Management Unit Subscription Agreement (measured as of the later of (x) the termination date and (y) the six month anniversary of the grant date) of such vested

Class B non-voting equity unit of RT Investments or vested Class C non-voting equity unit of RT Investments, as applicable' provided that the Company's board of directors shall have the right, in its sole discretion, to increase the purchase price as set forth above if the director's active employment with the Company is terminated due to: (i) the disability or death of the director; (ii) (A) by the Company without cause or (B) by the director with good reason; or (iii) any other reason not set forth in (i) or (ii) above after the second anniversary of the grant date.

SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT

RT Investments owns 100% of the capital stock of Parent, which in turn holds 100% of the capital stock of Radiation Therapy Services, Inc., the issuer of the notes in this offering. The following table sets forth certain information with respect to the beneficial ownership of RT Investments' equity units as of December 31, 2011 by: (i) each person or entity who owns of record or beneficially 5% or more of any class of RT Investments' voting securities; (ii) each of our directors, (iii) each of our named executive officers and (iv) all of our directors and executive officers as a group. Beneficial ownership is determined in accordance with Rule 13d-3 under the Exchange Act. In computing the number of shares beneficially owned by a person and the percentage ownership of that person, shares of equity units subject to options held by that person that are currently exercisable or exercisable within 60 days of December 31, 2011 are deemed outstanding. Such shares, however, are not deemed outstanding for the purposes of computing the percentage ownership of any other person. The respective percentages of beneficial ownership of Class A voting equity units of RT Investments, Class B non-voting equity units of RT Investments, Class C non-voting equity units of RT Investments and non-voting preferred equity units of RT Investments owned is based on 10,261,347 shares of Class A voting equity units of RT Investments, 512,448 shares of Class B non-voting equity units of RT Investments, 916,809 shares of Class C non-voting equity units of RT Investments and 541,308 shares of non-voting preferred equity units of RT Investments outstanding as of December 31, 2011. This information has been furnished by the persons named in the table below or in filings made with the SEC. Unless otherwise indicated, the address of each of the directors and executive officers is c/o Radiation Therapy Services, Inc., 2270 Colonial Boulevard, Fort Myers, Florida 33907.

	Class A Units		Class B Units(3)		Class C Units(3)		Preferred Units	
Name of Beneficial Owner	**Number(1)**	**Percent**	**Number(1)**	**Percent**	**Number(1)**	**Percent**	**Number(1)**	**Percent**
Principal shareholder:								
Funds affiliated with Vestar(2)	8,286,564	80.8%	—	—	—	—	437,134	80.8%
Directors and named executive officers:								
Daniel E. Dosoretz, M.D.(4)	717,107	7.0%	282,428	55.1%	337,235	36.8%	37,829	7.0%
James L. Elrod, Jr.(5)	—	—	—	—	—	—	—	—
Bryan J. Carey(6)	—	—	—	—	—	—	—	—
Anil Shrivastava(7)	—	—	—	—	—	—	—	—
Erin L. Russell(8)	—	—	—	—	—	—	—	—
James H. Rubenstein, M.D.(9)	354,569	3.5%	12,630	2.5%	32,665	3.6%	18,704	3.5%
Alejandro Dosoretz	258,955	2.5%	12,499	2.4%	32,325	3.5%	13,660	2.5%
Howard M. Sheridan, M.D.	179,277	1.7%	4,210	*	10,888	1.2%	9,457	1.7%
Kerrin E. Gillespie	2,392	*	4,166	*	—	—	126	*
Eduardo Fernandez, M.D., Ph.D.(10)	15,936	*	8,420	1.6%	21,777	2.4%	841	*
Constantine A. Mantz, M.D.	7,968	*	8,420	1.6%	21,777	2.4%	420	*
Joseph Garcia	—	—	20,831	4.1%	53,874	5.9%	—	—
Norton L. Travis(11)	15,936	*	42,101	8.2%	108,883	11.9%	841	*
All directors and executive officers as a group (8 persons)	1,301,151	12.7%	383,250	74.8%	597,987	65.2%	68,639	12.7%

* Represents less than 1%

(1) Fractional units have been round to the nearest highest integer.

(2) Includes 4,260,078 shares of Class A voting equity units of RT Investments and 224,728 shares of non-voting preferred equity units of RT Investments held by Vestar Capital Partners V, L.P., 1,171,620 shares of Class A voting equity units of RT Investments and 61,806 shares of non-voting preferred equity units of RT Investments held by Vestar Capital Partners V-A, L.P., 70,756 shares of Class A voting equity units of RT Investments and 3,733 shares of non-voting preferred equity units of RT Investments held by Vestar Executives V, L.P. and 234,398 shares of Class A voting equity units of RT Investments and 12,365 shares of non-voting preferred equity units of RT Investments held by Vestar Holdings V, L.P. Vestar Associates V, L.P. is the general partner of Vestar Capital Partners V, L.P., Vestar Capital Partners V-A, L.P., Vestar Executives V, L.P. and Vestar Holdings V, L.P. and Vestar Managers V Ltd. is the general partner of Vestar Associates V, L.P. As such, Vestar Managers V Ltd. has sole voting and dispositive power over the shares held by Vestar and its affiliated funds. Vestar's co-investors, which Vestar controls, own 2,549,712 shares of Class A voting equity units of RT Investments, or approximately 25% of Class A voting equity units of RT Investments, and 134,503 shares of non-voting preferred equity units of RT Investments, or approximately 26% of the preferred equity units of RT Investments. As such, Vestar and its affiliates control, and may be deemed to beneficially own 8,286,564 shares of Class A voting equity units of RT Investments, or approximately 81% of the Class A voting equity units of RT Investments, and 437,123 shares of the non-voting preferred equity units of RT Investments, or approximately 81% of the preferred equity units of RT Investments, through its ability to directly or indirectly control its co-investors. Each of Vestar and its affiliated funds disclaims beneficial ownership of such securities, except to the extent of its pecuniary interest therein. The address for each of Vestar and its affiliated funds is c/o Vestar Capital Partners, Inc., 245 Park Avenue, 41st Floor, New York, New York 10167.

(3) Class B units and Class C units are non-voting equity units of RT Investments issued under a management incentive equity plan pursuant to which certain employees are eligible to receive incentive unit awards from an equity pool representing up to 13% of the common equity value of RT Investments following return of preferred capital and accreted return on preferred capital, which as of December 31, 2011 was 12.1%.

(4) These shares are held in trusts for which Dr. Dosoretz and his descendants are beneficiaries. Dr. Dosoretz is the trustee of the trusts and as such, has sole voting and investment power with respect to the shares in the trusts.

(5) Mr. Elrod is a managing director of Vestar, and therefore may be deemed to beneficially own the Class A voting equity units of RT Investments and the non-voting preferred equity units of RT Investments held by Vestar, its affiliated funds and its co-investors. Mr. Elrod disclaims beneficial ownership of such securities, except to the extent of his pecuniary interest therein. The address for Mr. Elrod is c/o Vestar Capital Partners, Inc., 245 Park Avenue, 41st Floor, New York, New York 10167.

(6) Mr. Carey is a managing director of Vestar, and therefore may be deemed to beneficially own the Class A voting equity units of RT Investments and the non-voting preferred equity units of RT Investments held by Vestar, its affiliated funds and its co-investors. Mr. Carey disclaims beneficial ownership of such securities, except to the extent of his pecuniary interest therein. Mr. Carey has served as our Interim Chief Financial Officer since May 2011 and previously served as our interim Chief Financial Officer from August 2009 until March 15, 2010. The address for Mr. Carey is c/o Vestar Capital Partners, Inc., 245 Park Avenue, 41st Floor, New York, New York 10167.

(7) Mr. Shrivastava is a managing director of Vestar, and therefore may be deemed to beneficially own the Class A voting equity units of RT Investments and the non-voting preferred equity units of RT Investments held by Vestar, its affiliated funds and its co-investors. Mr. Shrivastava disclaims beneficial ownership of such securities, except to the extent of his pecuniary interest therein. The address for Mr. Shrivastava is c/o Vestar Capital Partners, Inc., 245 Park Avenue, 41st Floor, New York, New York 10167.

(8) Ms. Russell is a principal of Vestar, and therefore may be deemed to beneficially own the Class A voting equity units of RT Investments and the non-voting preferred equity units of RT Investments held by Vestar, its affiliated funds and its co-investors. Ms. Russell disclaims beneficial ownership of such securities, except to the extent of her pecuniary interest therein. The address for Ms. Russell is c/o Vestar Capital Partners, Inc., 245 Park Avenue, 41st Floor, New York, New York 10167.

(9) These shares are held in trusts for which Dr. Rubenstein and his descendants are beneficiaries. Dr. Rubenstein is the trustee of the trusts and as such, has sole voting and investment power with respect to the shares in the trusts.

(10) These shares are held in common Angelica Guckes, Dr. Fernandez's spouse. Dr. Fernandez and Mrs. Guckes share voting and investment powers with respect to these shares.

(11) These shares are pledged as security for a loan. The address for Mr. Travis is c/o Radiation Therapy Services, Inc., 1010 Northern Boulevard, Suite 314, Great Neck, New York 11021.

For information relating to Securities Authorized for Issuance Under Equity Compensation Plans, see "Item 5. Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities", incorporated by reference herein.

Item 13. ***Certain Relationships and Related Transactions, and Director Independence***

RTS's board of directors has not adopted a written policy or procedure for the review, approval and ratification of related party transactions, as the Audit Compliance Committee Charter already requires the Audit Compliance Committee to review all relationships and transactions in which RTS and its employees, directors and officers or their immediate family members are participants to determine whether such persons have a direct or indirect material interest. Based on all the relevant facts and circumstances, RTS's Audit Committee will decide whether the related-party transaction is appropriate and will approve only those transactions that are in the best interests of RTS.

References in this Item 13 to "we", "us", "our" and "the Company" are references to Radiation Therapy Services, Inc. and its subsidiaries, consolidated professional corporations and associations and unconsolidated affiliates, unless the context requires otherwise or unless indicated otherwise.

Set forth below are certain transactions and relationships between us and our directors, executive officers and equityholders that have occurred during the last three years.

Merger Transaction

On October 19, 2007, we entered into the Merger Agreement with RT Investments, Parent and RTS MergerCo, Inc., a wholly-owned subsidiary of Parent, pursuant to which we consummated the Merger. Upon completion of the Merger, each share of the Company's common stock outstanding immediately prior to the effective time of the Merger (other than certain shares held by members of RT Investments' management team and certain employees) was converted into $32.50 in cash without interest. The Closing occurred on February 21, 2008. Immediately following the Closing, Parent became the owner of all of the outstanding common stock of the Company, which in turn, became a wholly-owned indirect subsidiary of RT Investments, and Vestar and its affiliates became the beneficial owners of approximately 57% of the outstanding Class A voting equity units of RT Investments and its co-investors became the beneficial owners of approximately 26% of the outstanding Class A voting equity units of RT Investments. As a result, Vestar and its affiliates currently control approximately 83% of the Class A voting equity units of RT Investments through its ability to directly or indirectly control its co-investors. In addition, at the Closing, the management investors, including current and former directors and executive officers, either exchanged certain shares of the Company's common stock or invested cash in the Company, in each case, in exchange for Class A voting equity units and non-voting preferred equity units of RT Investments as further described below. At the Closing, these management investors as a group became the beneficial owners of approximately 17% of the outstanding Class A voting equity units of RT Investments. RT Investments also adopted a management incentive equity plan pursuant to which certain employees are eligible to receive incentive unit awards (Class B and C non-voting equity units) from an equity pool representing up to 13% of the common equity value of RT Investments, which as of December 31, 2011 was 12.1%. In connection with the Closing, Vestar, its affiliates and these management investors invested approximately $627.3 million in equity units of RT Investments.

Administrative Services Agreements

In California, Delaware, Maryland, Massachusetts, Nevada, New York and North Carolina, we have administrative services agreements with professional corporations owned by certain of our

directors, executive officers and equityholders, who are licensed to practice medicine in such states. Drs. Dosoretz, Rubenstein and Michael J. Katin, M.D., a former director on the Company's board of directors as well as a director on the boards of directors of several of our subsidiaries and an equityholder of RT Investments, own interests in these professional corporations ranging from 0% to 100%.

We have entered into these administrative services agreements in order to comply with the laws of such states which prohibit us from employing physicians. Our administrative services agreements generally obligate us to provide treatment center facilities, staff and equipment, accounting services, billing and collection services, management and administrative personnel, assistance in managed care contracting and assistance in marketing services. Terms of the agreements are typically 20-25 years and renew automatically for successive five-year periods, with certain agreements having 30 year terms and automatically renewing for successive one-year periods. The administrative services agreements also contain restrictive covenants that preclude the professional corporations from providing substantially similar healthcare services, hiring another management services organization and soliciting our employees, customers and clients for the duration of the agreement and some period after termination, usually three years. Monthly fees for such services may be computed on a fixed basis, percentage of net collections basis, or on a per treatment basis, depending on the particular state requirements. The administrative services fees paid to us by such professional corporations under the administrative services agreements were approximately $87.2 million, $83.5 million and $79.7 million for the years ended December 31, 2009, 2010 and 2011, respectively. These annual fees are subject to renegotiation on an annual basis, and we had engaged an independent consultant to complete a fair market value annual review of the fees paid by these professional service corporations to us under the terms of the administrative services agreements, except for the administrative services agreement where we are paid on a percentage of gross or net income. The consulting firm completed its review in 2010 for the 2009 fees under the New York and North Carolina administrative services agreements. With respect to any new centers to date in 2011 that required an administrative services agreement, the Audit Committee approved the utilization by management of the same underlying fee methodology used in the California, Maryland, Nevada, Massachusetts, New York and/or North Carolina administrative services agreements based on the fair market value review completed by the independent consultant.

In addition, we have transition services agreements with the professional corporations owned by Drs. Dosoretz, Rubenstein and Katin, which correspond to the administrative services agreements. The transition services agreements provide that (i) the term of the agreements corresponds to the respective administrative services agreement and any renewals thereof, (ii) the shareholders grant us a security interest in the shares held by them in the professional corporation, and (iii) the shareholders are prohibited from making any transfer of the shares held by them in the professional corporation, including through intestate transfer, except to qualified shareholders with our approval. Upon certain shareholder events of transfer (as defined in the transition services agreements), including a transfer of shares by any shareholder without our approval or the loss of a shareholder's license to practice radiation therapy in his or her applicable state, for a period of 30 days after giving notice to us of such event, the other shareholders have an opportunity to buy their pro-rata portion of the shares being transferred. If at the end of the 30-day period, any of the transferring shareholder's shares have not been acquired, then, for a period of 30 days, the professional corporation has the option to purchase all or a portion of the shares. If at the end of that 30-day period any of the transferring shareholder's shares have not be acquired, we must designate a transferee to purchase the remaining shares. The purchase price for the shares shall be the fair market value as determined by our auditors. Upon other events relating to the professional corporation, including uncured defaults, we shall designate a transferee to purchase all of the shares of the professional corporation.

Lease Arrangements with Entities Owned by Related Parties

We lease certain of our treatment centers and other properties from partnerships which are majority-owned by Drs. Dosoretz, Rubenstein, Sheridan, Katin and Mantz and Dr. Fernandez, our Senior Vice President, Director of Regional Operations. As of December 31, 2010, Drs. Dosoretz, Rubenstein, Sheridan, Katin, Fernandez and Mantz have ownership interests in these entities ranging from 0% to 100%. These leases have expiration dates through December 31, 2026, and provide for annual lease payments and executory costs, ranging from approximately $58,000 to $1.7 million. The aggregate lease payments we made to these entities were approximately $10.2 million, $14.5 million and $15.8 million for the years ended December 31, 2009, 2010 and 2011, respectively. The rents were determined on the basis of the debt service incurred by the entities and a return on the equity component of the project's funding. Prior to completing our initial public offering in June 2004, we engaged an independent consultant to complete a fair market rent analysis for the real estate leases with the real estate entities owned by our directors, executive officers and other management employees. The consultant determined that, with one exception, the rents were at fair market value. We negotiated a rent reduction for the one exception to bring it to fair market value as determined by the consultant. Since 2004, an independent consultant is utilized to assist the Audit/Compliance Committee in determining fair market rental for any renewal or new rental arrangements with any affiliated party.

In October 1999, we entered into a sublease arrangement with a partnership, which is 62.4% owned by Drs. Dosoretz, Rubenstein, Sheridan and Katin as of December 31, 2011, to lease space to the partnership for an MRI center in Mount Kisco, New York. Sublease rentals paid by the partnership to the landlord were approximately $761,000, $673,000 and $733,000 for the years ended December 31, 2009, 2010 and 2011, respectively.

We also maintain a construction company which provides remodeling and real property improvements at certain of our facilities. This construction company builds and constructs leased facilities on the lands owned by Drs. Dosoretz, Rubenstein, Sheridan and Katin. Payments received by us for building and construction fees were approximately $0.5 million, $0.5 million and $1.4 million for the years ended December 31, 2009, 2010 and 2011, respectively. Amounts due to us for the construction services were approximately $49,000 at December 31, 2011.

In connection with our plans with respect to future development of new treatment centers on land owned by or contemplated to be acquired by land partnerships owned by certain of our directors, executive officers and equityholders, the terms and conditions of the transactions, including leases of such property and in some instances buildout and equipment reimbursements by us are expected to be on terms and conditions as those of similar historic transactions.

Securityholders Agreement

Each of our directors and executive officers who is a holder of equity units of RT Investments, including Drs. Dosoretz, Sheridan, Rubenstein, Katin, Mantz and Fernandez and Ms. Dornaus, our Senior Vice President and Chief Compliance Officer, and Mr. Travis is a party to an Amended and Restated Securityholders Agreement with RT Investments governing the rights and obligations of holders of units of RT Investments. The Amended and Restated Securityholders Agreement provides, among other things:

- for supermajority voting provisions with respect to certain corporate actions, including certain transactions with Vestar and those that disproportionately alter the rights, preferences or characteristics of Vestar's preferred units of RT Investments disproportionately as compared to the other securityholders;
- that RT Investments has a right of first refusal to purchase the securities of certain securityholders wishing to sell their interests;

- that if Vestar elects to consummate a transaction resulting in the sale of RT Investments, the securityholders must consent to the transaction and take all other actions reasonably necessary to cause the consummation of the transaction;
- that the securityholders must cause the board of managers of RT Investments to consist of four managers designated by Vestar and its affiliates, two independent managers designed by an affiliate of Vestar after consultation with Dr. Dosoretz, and two management managers, which currently are Drs. Rubenstein and Sheridan, designated by Dr. Dosoretz after consultation with Vestar, for so long as Dr. Dosoretz is the Chief Executive Officer of the Company, subject to a reduction of the two management managers upon a decrease in the ownership interests in RT Investments held by certain management holders or failure by the Company to achieve certain performance targets;
- for restrictions on the transfer of the units of RT Investments held by the securityholders;
- for participation rights to certain securityholders so that they may maintain their percentage ownership in RT Investments in the event RT Investments issues additional equity interests; and
- for registration rights, whereby, upon the request of certain majorities of certain groups of securityholders, RT Investments must use its reasonable best efforts to effect the registration of its securities under the Securities Act.

The Securityholders Agreement also provides for a management agreement to be entered into among the Company, RT Investments, Parent and Vestar, which is described below.

Management Agreement

In connection with the Merger, each of the Company, RT Investments and Parent entered into a Management Agreement with Vestar relating to certain advisory and consulting services Vestar provides to the Company, RT Investments and Parent. Under the Management Agreement, Vestar received a $10.0 million transaction fee upon the Closing for services rendered in connection with the Closing and was reimbursed for its reasonable out of pocket expenses. The Management Agreement also provides for Vestar to receive an annual management fee equal to the greater of (i) $850,000 or (ii) an amount equal to 1.0% of the Company's consolidated EBITDA, which fee will be payable quarterly, in advance. Vestar is also entitled to a fee for any financial advisory or similar services it provides in connection with a sale of the Company or a transaction relating to any acquisition, divestiture or other transaction by or involving RT Investments, Parent, the Company or any of their respective subsidiaries, subject to approval by the management managers under the Amended and Restated Securityholders Agreement. RT Investments, Parent and the Company must indemnify Vestar and its affiliates against all losses, claims, damages and liabilities arising out of the performance by Vestar of its services pursuant to the Management Agreement, other than those that have resulted primarily from the gross negligence or willful misconduct of Vestar and/or its affiliates.

The Management Agreement will terminate upon the earlier of (i) such time when Vestar and its affiliates hold, directly or indirectly, less than 20% of the voting power of the Company's outstanding voting stock, (ii) a Public Offering (as defined in the Amended and Restated Securityholders Agreement) or (iii) a sale of RT Investments, Parent or the Company in accordance with the Amended and Restated Securityholders Agreement.

During 2010, we paid $2.0 million to Vestar Capital Partners V, L.P. for additional transaction advisory services in respect to the incremental amendments to our senior secured revolving credit facility, the additional $15.0 million of commitments to the revolver portion, and the complete refinancing of the senior subordinated notes. We paid approximately $1.3 million, $1.3 million and $1.6 million in management fees to Vestar for the years ended December 31, 2009, 2010 and 2011, respectively.

Management Stock Contribution and Unit Subscription Agreement

In connection with the Closing, RT Investments entered into various Management Stock Contribution and Unit Subscription Agreements with our management employees, including Drs. Dosoretz, Sheridan, Rubenstein, Katin, Mantz and Fernandez, Mr. Gillespie and Ms. Dornaus and Messrs. Travis and Watson (each, an "Executive"), pursuant to which they exchanged certain shares of the Company's common stock held by them immediately prior to the effective time of the Merger or invested cash in the Company, in each case, in exchange for non-voting preferred equity units and Class A voting equity units of RT Investments. Under the Management Stock Contribution and Unit Subscription Agreements, if an Executive's employment is terminated by death or disability, by RT Investments and its subsidiaries without "cause" or by the Executive for "good reason" (each as defined in the respective Management Stock Contribution and Unit Subscription Agreement), or by RT Investments or its subsidiaries for "cause" or by the Executive for any other reason except retirement, or the Executive violates the non-compete or confidentiality provisions, RT Investments has the right and option to purchase, for a period of 90 days following the termination, any and all units held by the Executive or the Executive's permitted transferees, at the fair market value determined in accordance with the applicable Management Stock Contribution and Unit Subscription Agreement, subject to certain exceptions and limitations. Under Dr. Dosoretz's Management Stock Contribution and Unit Subscription Agreement, he also has certain put option rights to require RT Investments to repurchase his non-voting preferred equity units and Class A voting equity units if, prior to a sale of RT Investments, Parent or the Company in accordance with the Amended and Restated Securityholders Agreement or a Public Offering (as defined in the Amended and Restated Securityholders Agreement), his employment is terminated without cause or he terminates his employment for good reason and at such time RT Investments has met certain performance targets.

Amended and Restated Limited Liability Company Agreement

Each of our directors and executive officers who is a holder of equity units of RT Investments, including Drs. Dosoretz, Sheridan, Rubenstein, Katin, Mantz and Fernandez, Ms. Dornaus, and Mr. Travis is a party to an Amended and Restated Limited Liability Company Agreement with RT Investments governing affairs of RT Investments and the conduct of its business. The Amended and Restated Limited Liability Company Agreement sets forth certain terms of the equity units held by members of RT Investments, including, among other things, the right of members to receive distributions, the voting rights of holders of equity units and the composition of the board of managers, subject to the terms of the Amended and Restated Securityholders Agreement. Under the Amended and Restated Limited Liability Company Agreement, Vestar's prior written consent is required for RT Investments to take engage in certain types of transactions, including mergers, acquisitions, asset sales, and incur indebtedness and make capital expenditures, subject to exceptions and limitations. The Amended and Restated Limited Liability Company Agreement contains customary indemnification provisions relating to holders of units and managers and officers of RT Investments.

Employment Agreement and Certain Employees

We have entered into employment agreements with certain of our executive officers and directors, which contain compensation, severance, non-compete and confidentiality provisions. In addition, we have employed, and continue to employ, directly or indirectly, immediate family members of certain of our directors, executive officers and equityholders, including Dr. Dosoretz's brother (as further described below), Dr. Dosoretz's daughter, Amy Fox, M.D., and Dr. Rubenstein's brother, Paul Rubenstein. Alejandro Dosoretz received compensation under an executive employment agreement of approximately $545,000 for the year ended December 31, 2011. Amy Fox, M.D. received compensation under a physician employment agreement of approximately $53,000, $283,000 and $339,000 for the years ended December 31, 2009, 2010 and 2011, respectively. Paul Rubenstein received compensation as

our Director of Physician Contracting of approximately $169,000, $171,000 and $173,000 for the years ended December 31, 2009, 2010 and 2011, respectively.

Indemnification Agreements with Certain Officers and Directors

We have entered into indemnification agreements with certain of our directors and executive officers prior to the Merger. The indemnification agreements provide, among other things, that the Company will, to the extent permitted by applicable law, indemnify and hold harmless each indemnitee if, by reason of his or her status as a director, officer, trustee, general partner, managing member, fiduciary, employee or agent of the Company or of any other enterprise which such person is or was serving at the request of the Company, such indemnitee was, is or is threatened to be made, a party to in any threatened, pending or completed proceeding, whether brought in the right of the Company or otherwise and whether of a civil, criminal, administrative or investigative nature, against all expenses (including attorneys' and other professionals' fees), judgments, fines, penalties and amounts paid in settlement actually and reasonably incurred by him or her or on his or her behalf in connection with such proceeding. The indemnitee shall not be indemnified unless he or she acted in good faith and in a manner he or she reasonably believed to be in the best interests of the Company, or for willful misconduct. In addition, the indemnification agreements provide for the advancement of expenses incurred by the indemnitee in connection with any such proceeding to the fullest extent permitted by applicable law. The indemnification agreements terminate upon the later of five years after the date that the indemnitee ceased to serve as a director and/or executive officer or the date of the final termination of any proceedings subject to the indemnification agreements. The Company agrees not to bring any legal action against the indemnitee or his or her spouse or heirs after two years following the date the indemnitee ceases to be a director and/or executive officer of the Company. The indemnification agreements do not exclude any other rights to indemnification or advancement of expenses to which the indemnitee may be entitled, including any rights arising under the Articles of Incorporation or Bylaws of the Company, or the Florida Business Corporation Act.

In connection with the Merger, we agreed that we would not alter or impair any existing indemnification provisions then in existence in favor of then current or former directors or officers as provided in the Articles of Incorporation or Bylaws of the Company or as evidenced by indemnification agreements with us.

Medical Developers, LLC Acquisition

On January 1, 2009, we entered into a Membership Interest Purchase Agreement with Lisdey S.A. an Uruguay corporation, Alejandro Dosoretz, Dr. Daniel Dosoretz's brother, and Bernardo Dosoretz, Dr. Daniel Dosoretz's father, and the spouses of Alejandro Dosoretz and Bernardo Dosoretz, pursuant to which we purchased a 33% interest in MDLLC, an entity that is now the majority owner and operator of 29 freestanding radiation oncology practices (of which two are under development) through 15 legal entities South America, Central America and the Caribbean (which translates into us owning a 19% indirect ownership interest in the underlying radiation therapy treatment centers), and a 19% interest in Clinica de Radioterapia La Asuncion S.A., an entity that operates a treatment center in Guatemala. We purchased the 33% interest in MDLLC and the 19% interest in Clinica de Radioterapia La Asuncion S.A. at an aggregate purchase price of approximately $12.3 million, with a four-year call option to purchase the remaining 67% in MDLLC, which would result in an ownership interest of approximately 91% in the underlying radiation oncology practices located in South America, Central America and the Caribbean, at a price based on a multiple of historical earnings before interest, taxes, depreciation and amortization. In connection with our entry into the Membership Interest Purchase Agreement, Alejandro Dosoretz entered into an employment agreement with an entity located in Argentina in which we hold interests as part of a joint venture, pursuant to which he receives an annual salary of approximately $180,000 for his services.

On March 1, 2011, RTSII, RT Investments, the Company, and our wholly-owned subsidiary Main Film B.V., entered into the Membership Interest Purchase Agreements with Alejandro Dosoretz, and his spouse and Bernardo Dosoretz and his representative, to purchase the remaining 67% membership interest in MDLLC, as well as direct ownerships interests held by Alejandro Dosoretz and Bernardo Dosoretz in such entities and a 61% ownership interest in Clinica de Radioterapia La Asuncion, S.A.

Under the terms of the Membership Interest Purchase Agreements, RTSII and its subsidiaries purchased an additional 72% of the remaining interests in the entities, which when combined with RTSII's purchase of a 33% interest in MDLLC in January 2009, results in a 91% ownership interest in the entities. The aggregate purchase price for the MDLLC Purchase was $82.7 million and was determined based upon a multiple of historical earnings before interest, taxes, depreciation and amortization, and excess working capital. The purchase price was comprised of $47.5 million in cash, $16.05 million in Notes, $16.25 million of equity in the form of 25 shares of our common stock, and issuance of real estate located in Costa Rica totaling $0.6 million. In addition to the purchase price paid at closing, Alejandro Dosoretz also has the right to receive an earnout payment from RTSII based on a multiple of future earnings before interest, taxes, depreciation and amortization of certain radiation oncology centers acquired in the MDLLC Purchase, which such earnout payment, if any, would be paid one-half in the form of Notes and one-half in the form of equity of RT Investments. We recorded a contingent earnout accrual of approximately $2.3 million in our purchase price accounting for the MDLLC Purchase. In connection with the MDLLC Purchase, RT Investments entered into the Contribution Agreement with Alejandro Dosoretz pursuant to which he exchanged the 25 shares of our common stock he received in the MDLLC Purchase for approximately 13,660 non-voting preferred equity units of RT Investments and approximately 258,955 Class A voting equity units of RT Investments, having an aggregate value of $16.25 million. Pursuant to one of the Membership Interest Purchase Agreements, Alejandro Dosoretz has the right to invest 10% (or more than 10% if approved by RTSII) of the cost of certain specific new radiation oncology centers of MDLLC and Clinica de Radioterapia La Asuncion S.A. in exchange for a 10% ownership interest in such new centers and an additional interest, which when combined with the 10% ownership interest, would entitle him to a return of his invested capital and 20% of the residual value of such new centers. RTSII has an option to buy such interests in the new centers on the third anniversary of the closing, and Alejandro Dosoretz has a right to sell such interests in the new centers on the fifth anniversary of the closing.

In 2010, we provided medical equipment and parts inventory to MDLLC in the amount of approximately $769,000. As of December 31, 2010, amounts due from the sale of the equipment, including accrued interest were approximately $781,000. In connection with the acquisition of MDLLC, we have advanced up to $500,000 for the purchase and implementation of a new accounting software system.

Other Related Party Transactions

We provide billing and collection services to Riverhill MRI Specialists, P.C. ("Riverhill MRI"), a provider of medical services in New York, of which approximately 62.4% is owned by Drs. Dosoretz, Rubenstein, Sheridan and Katin as of December 31, 2010. In addition, we charge Riverhill MRI for certain allocated costs of certain staff that perform services on behalf of Riverhill MRI. The fees received by us for the billing and collection services and for reimbursement of certain allocated costs were approximately $200,000 and $2,000 for the years ended December 31, 2008, and 2009, respectively. No balance was due from Riverhill MRI at December 31, 2010 and 2011.

We are a participating provider in an oncology network, of which Dr. Dosoretz has an ownership interest. We provide oncology services to members of the network. Payments received by us for services rendered in 2009, 2010 and 2011 were approximately $813,000, $867,000 and $884,000, respectively.

In October 2003, we contracted with Batan Insurance Company SPC, LTD, an entity which is owned by Drs. Dosoretz, Rubenstein, Sheridan and Katin to provide us with malpractice insurance coverage. We paid premium payments to Batan Insurance Company SPC, LTD of approximately $6.9 million, $5.4 million and $5.7 million for the years ended December 31, 2009, 2010 and 2011, respectively.

Director Independence

The board is currently composed of seven directors, none of which is likely to qualify as an independent director based on the definition of independent director under the Nasdaq rules. Because affiliates of Vestar own more than 50% of the voting common stock of RT Investments, we would be a "controlled company" under the Nasdaq rules, which would qualify us for exemptions from certain corporate governance rules of The Nasdaq Stock Market, including the requirements that the board of directors be composed of a majority of independent directors.

Item 14. ***Principal Accounting Fees and Services***

The following table presents fees for professional audit and other services rendered by our independent registered public accounting firm, Ernst & Young LLP, for the years ended December 31, 2011 and 2010.

Type of Fees	2011	2010
Audit fees	$1,113,000	$1,435,000
Audit-related fees	15,000	198,000
Tax fees	425,000	337,000
All other	—	—
Total	$1,553,000	$1,970,000

Fees for audit services included fees associated with the annual audit, reviews of the Company's quarterly reports, and services in connection with debt offerings and SEC regulatory filings. Audit-related fees principally included agreed-upon procedures and internal control analysis. Tax fees included tax compliance, tax advice, and tax planning. All other fees include fees not included in the other categories.

The audit committee has considered whether the provision of non-audit services is compatible with maintaining the principal accountant's independence and has concluded that the non-audit services provided by Ernst & Young LLP are compatible with maintaining Ernst & Young LLP's independence.

Pre-Approval Policies and Procedures

The audit committee approves in advance all audit and non-audit services to be performed by the Company's independent registered public accounting firms. The audit committee considers whether the provision of any proposed non-audit services is consistent with the SEC's rules on auditor independence and has pre-approved certain specified audit and non-audit services to be provided by Ernst & Young LLP and Deloitte & Co. S.R.L. for up to twelve (12) months from the date of the pre-approval. If there are any additional services to be provided, a request for pre-approval must be submitted to the audit committee for its consideration.

PART IV

Item 15. ***Exhibits and Financial Statement Schedules***

(a) Index to Consolidated Financial Statements, Financial Statement Schedules and Exhibits:

(1) ***Consolidated Financial Statements:***

See Item 8 in this report.

The consolidated financial statements required to be included in Part II, Item 8, are indexed on Page F-1 and submitted as a separate section of this report.

(2) ***Consolidated Financial Statement Schedules:***

All schedules are omitted because they are not applicable or not required, or because the required information is included in the consolidated financial statements or notes in this report.

(3) ***Exhibits***

The Exhibits are incorporated by reference to the Exhibit Index included as part of this Annual Report on Form 10-K.

INDEX TO CONSOLIDATED FINANCIAL STATEMENTS

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

The Board of Directors and Shareholder of
Radiation Therapy Services Holdings, Inc.

We have audited the accompanying consolidated balance sheets of Radiation Therapy Services Holdings, Inc. as of December 31, 2011 and 2010, and the related consolidated statements of comprehensive loss, cash flows, and equity for each of the three years in the period ended December 31, 2011. These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these financial statements based on our audits. We did not audit the combined special-purpose financial statements of the Operating Entities of Medical Developers, LLC, majority-owned subsidiaries, which statements reflect total assets of $136 million as of December 31, 2011 and total revenues of $60 million for the ten month period then ended. Those statements were audited by other auditors whose report has been furnished to us, and our opinion, insofar as it relates to the amounts included for the operating entities of Medical Developers LLC, is based solely on the report of the other auditors.

We conducted our audits in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. We were not engaged to perform an audit of the Company's internal control over financial reporting. Our audits included consideration of internal control over financial reporting as a basis for designing audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion. An audit also includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements, assessing the accounting principles used and significant estimates made by management, and evaluating the overall financial statement presentation. We believe that our audits and the report of other auditors provide a reasonable basis for our opinion.

In our opinion, based on our audits and the report of other auditors, the financial statements referred to above present fairly, in all material respects, the consolidated financial position of Radiation Therapy Services Holdings, Inc. at December 31, 2011 and 2010, and the consolidated results of its operations and its cash flows for each of the three years in the period ended December 31, 2011, in conformity with U.S. generally accepted accounting principles.

/s/ Ernst & Young LLP
Certified Public Accountants

Tampa, Florida

March 22, 2012

RADIATION THERAPY SERVICES HOLDINGS, INC.

CONSOLIDATED BALANCE SHEETS

(in thousands, except share and per share amounts)

	December 31	
	2011	2010
Assets		
Current assets:		
Cash and cash equivalents ($2,922 and $4,981 related to VIEs)	$ 10,177	$ 13,977
Accounts receivable, net ($17,934 and $19,670 related to VIEs)	87,094	63,571
Prepaid expenses ($414 and $376 related to VIEs)	5,731	6,969
Inventories ($168 and $17 related to VIEs)	4,308	2,647
Deferred income taxes	2,969	2,276
Other ($756 and $851 related to VIEs)	6,025	2,313
Total current assets	116,304	91,753
Equity investments in joint ventures	692	20,136
Property and equipment, net ($22,910 and $22,069 related to VIEs)	236,411	229,665
Real estate subject to finance obligation	13,719	8,100
Goodwill ($18,879 and $13,190 related to VIEs)	556,547	770,898
Intangible assets, net ($1,363 and $792 related to VIEs)	42,393	85,236
Other assets ($8,106 and $9,159 related to VIEs)	32,526	30,542
Total assets	$ 998,592	$1,236,330
Liabilities and Equity		
Current liabilities:		
Accounts payable ($2,282 and $3,385 related to VIEs)	$ 27,748	$ 21,888
Accrued expenses ($2,471 and $3,127 related to VIEs)	42,596	35,765
Income taxes payable ($31 and $0 related to VIEs)	5,310	5,994
Current portion of long-term debt	13,945	8,780
Current portion of finance obligation	161	53
Other current liabilities	6,615	197
Total current liabilities	96,375	72,677
Long-term debt, less current portion	665,088	590,051
Finance obligation, less current portion	14,105	8,515
Other long-term liabilities ($1,874 and $1,542 related to VIEs)	22,659	15,981
Deferred income taxes	10,343	33,527
Total liabilities	808,570	720,751
Noncontrolling interests—redeemable	12,728	7,371
Commitments and contingencies		
Equity:		
Common stock, $0.01 par value, 1,025 shares authorized, 1,025 and 1,000 shares issued, and outstanding at December 31, 2011 and 2010, respectively	—	—
Additional paid-in capital	648,703	630,989
Retained deficit	(483,815)	(130,374)
Note receivable from shareholder	(125)	(175)
Accumulated other comprehensive loss, net of tax	(4,890)	(3,391)
Total Radiation Therapy Services Holdings, Inc. shareholder's equity	159,873	497,049
Noncontrolling interests—nonredeemable	17,421	11,159
Total equity	177,294	508,208
Total liabilities and equity	$ 998,592	$1,236,330

The accompanying notes are an integral part of the consolidated financial statements.

RADIATION THERAPY SERVICES HOLDINGS, INC.
CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS

(in thousands):	Year Ended December 31, 2011	2010	2009
Revenues:			
Net patient service revenue	$ 638,690	$ 535,913	$517,646
Other revenue	6,027	8,050	6,838
Total revenues	644,717	543,963	524,484
Expenses:			
Salaries and benefits	326,782	282,302	259,532
Medical supplies	51,838	43,027	45,361
Facility rent expenses	33,375	27,885	22,106
Other operating expenses	33,992	27,103	24,398
General and administrative expenses	81,688	65,798	54,537
Depreciation and amortization	54,084	46,346	46,416
Provision for doubtful accounts	16,117	8,831	12,871
Interest expense, net	60,656	58,505	62,502
Loss on sale of assets of a radiation treatment center	—	1,903	—
Early extinguishment of debt	—	10,947	—
Impairment loss	360,639	97,916	3,474
Loss on investments	250	—	—
Gain on fair value adjustment of previously held equity investment	(234)	—	—
Loss on foreign currency transactions	106	—	—
Loss on forward currency derivative contracts	672	—	—
Total expenses	1,019,965	670,563	531,197
Loss before income taxes	(375,248)	(126,600)	(6,713)
Income tax (benefit) expense	(25,365)	(12,810)	1,002
Net loss	(349,883)	(113,790)	(7,715)
Net income attributable to noncontrolling interests—redeemable and non-redeemable	(3,558)	(1,698)	(1,835)
Net loss attributable to Radiation Therapy Services Holdings, Inc. shareholder	(353,441)	(115,488)	(9,550)
Other comprehensive income (loss):			
Unrealized gain on derivative interest rate swap agreements, net of tax	2,428	1,679	1,938
Unrealized loss on foreign currency translation	(4,909)	—	—
Unrealized loss on other comprehensive income from share of equity investee	—	(201)	(137)
Unrealized comprehensive (loss) income:	(2,481)	1,478	1,801
Comprehensive loss	(352,364)	(112,312)	(5,914)
Comprehensive income attributable to noncontrolling interests-redeemable and non-redeemable:	(2,914)	(1,698)	(1,835)
Comprehensive loss attributable to Radiation Therapy Services Holdings, Inc. shareholder	$ (355,278)	$(114,010)	$ (7,749)

The accompanying notes are an integral part of the consolidated financial statements.

RADIATION THERAPY SERVICES HOLDINGS, INC.
CONSOLIDATED STATEMENTS OF CASH FLOWS

(in thousands):	Year Ended December 31, 2011	2010	2009
Cash flows from operating activities			
Net loss	$(349,883)	$(113,790)	$ (7,715)
Adjustments to reconcile net loss to net cash provided by operating activities:			
Depreciation	45,972	39,011	31,837
Amortization	8,112	7,335	14,579
Deferred rent expense	1,271	1,180	3,199
Deferred income taxes	(28,378)	(19,698)	(1,335)
Stock-based compensation	1,461	1,030	962
Provision for doubtful accounts	16,117	8,831	12,871
Loss on the sale/disposal of property and equipment	235	734	1,341
Loss on the sale of assets of a radiation treatment center	—	1,903	—
Write-off of pro-rata debt discount	—	494	—
Write-off of loan costs	—	1,593	—
Extinguishment of debt	—	10,947	—
Termination of a derivative interest rate swap agreement	(1,880)	—	—
Write-off of acquisition-related costs	—	—	812
Impairment loss	360,639	97,916	3,474
Loss on investments	250	—	—
Gain on fair value adjustment of previously held equity investment	(234)	—	—
Loss on foreign currency transactions	98	—	—
Loss on forward currency derivative contracts	672	—	—
Amortization of debt discount	847	791	1,208
Amortization of loan costs	4,524	3,350	2,850
Equity interest in net loss (earnings) of joint venture	1,036	(1,001)	(880)
Distribution received from unconsolidated joint ventures	52	980	—
Changes in operating assets and liabilities:			
Accounts receivable and other receivables	(20,780)	(16,066)	(3,790)
Income taxes payable	(4,393)	6,477	13,141
Inventories and other current assets	(1,622)	107	10
Prepaid expenses	2,839	4,425	2,006
Accounts payable	2,808	8,454	(965)
Accrued expenses / other long-term liabilities	5,001	3,991	(2,213)
Net cash provided by operating activities	44,764	48,994	71,392
Cash flows from investing activities			
Purchases of property and equipment	(36,612)	(43,781)	(35,443)
Acquisition of medical practices	(59,886)	(43,388)	(2,449)
Restricted cash associated with earn-out provisions of acquisitions	—	—	2,269
Purchase of joint venture interests	—	(1,000)	(13,593)
Proceeds from sale of property and equipment	6	1,693	144
Repayments from employees	338	457	478
Contribution of capital to joint venture entities	(799)	(3,711)	(2,386)
Distribution received from joint venture	581	27	—
Proceeds from the sale of equity interest in a joint venture	312	—	—
Payments of foreign currency derivative contracts	(1,486)	—	—
Proceeds from sale of investments	1,035	—	—
Purchase of investments	(79)	—	—
Change in other assets and other liabilities	(192)	(2,808)	(3,192)
Net cash used in investing activities	(96,782)	(92,511)	(54,172)

The accompanying notes are an integral part of the consolidated financial statements.

RADIATION THERAPY SERVICES HOLDINGS, INC.
CONSOLIDATED STATEMENTS OF CASH FLOWS (Continued)

(in thousands):	Year Ended December 31, 2011	2010	2009
Cash flows from financing activities			
Proceeds from issuance of debt (net of original issue discount of $625, $1,950 and $0 respectively)	111,205	316,550	—
Principal repayments of debt	(57,777)	(271,295)	(29,693)
Repayments of finance obligation	(95)	(302)	(1,242)
Payment of call premium on senior subordinated notes	—	(5,250)	—
Proceeds from equity contribution	3	156	—
Payments of notes receivable from shareholder	50	50	25
Proceeds from issuance of noncontrolling interest	4,120	608	356
Cash distributions to noncontrolling interest holders—redeemable and non-redeemable	(4,428)	(3,176)	(2,876)
Deconsolidation of noncontrolling interest	(33)	(14)	—
Payments of debt issue costs	(4,809)	(12,791)	—
Net cash provided by (used in) financing activities	48,236	24,536	(33,430)
Effect of exchange rate changes on cash and cash equivalents	(18)	—	—
Net decrease in cash and cash equivalents	$ (3,800)	$ (18,981)	$(16,210)
Cash and cash equivalents, beginning of period	13,977	32,958	49,168
Cash and cash equivalents, end of period	$ 10,177	$ 13,977	$ 32,958
Supplemental disclosure of cash flow information			
Interest paid	$ 56,748	$ 57,688	$ 57,371
Income taxes paid (refunded)	$ 5,802	$ 411	$(10,776)
Supplemental disclosure of noncash transactions			
Recorded finance obligation related to real estate projects	$ 11,623	$ 3,756	$ 17,866
Recorded derecognition of finance obligation related to real estate projects	$ (5,829)	$ (72,117)	$ —
Recorded noncash deconsolidation of noncontrolling interest	$ 49	$ (64)	$ —
Recorded noncash purchase of noncontrolling interest in a joint venture	$ —	$ (475)	$ —
Recorded noncash contribution of capital by controlling interest holder	$ —	$ 602	$ —
Recorded noncash use of vendor credits	$ —	$ 2,027	$ —
Recorded capital lease obligations related to the purchase of equipment	$ 4,701	$ —	$ —
Recorded issuance of Parent equity units related to the acquisition of medical practices	$ 16,250	$ —	$ —
Recorded issuance of senior subordinated notes related to the acquisition of medical practices	$ 16,047	$ —	$ —
Recorded earn-out accrual related to the acquisition of medical practices	$ 2,340	$ —	$ —
Recorded additional consideration related to the acquisition of medical practices	$ 561	$ —	$ —
Recorded other non-current liabilities related to non-controlling interest related to the acquisition of medical practices	$ 1,364	$ —	$ —
Recorded issuance of notes payable related to the acquisition of medical practices	$ 4,005	$ —	$ —
Recorded noncash dividend declared to noncontrolling interest	$ 221	$ —	$ —
Recorded issuance of redeemable noncontrolling interest	$ 71	$ —	$ —
Recorded noncash contribution of capital by noncontrolling interest holder	$ —	$ —	$ 694
Recorded accounts payable liabilities related to the acceptance and delivery of medical equipment	$ —	$ —	$ 2,063
Recorded reduction in goodwill due to purchase price adjustment	$ —	$ —	$ 188
Recorded noncash distribution receivable and equity contribution payable from equity investee	$ —	$ —	$ 301
Recorded accounts payable related to the final purchase adjustment for an equity investee	$ —	$ —	$ 1,900

The accompanying notes are an integral part of the consolidated financial statements.

RADIATION THERAPY SERVICES HOLDINGS, INC.
CONSOLIDATED STATEMENTS OF CHANGES IN EQUITY

(in thousands except share amounts):	Common Stock Shares	Common Stock Amount	Additional Paid-In Capital	Retained Deficit	Note Receivable from Shareholder	Accumulated Other Comprehensive Loss	Noncontrolling interests—Nonredeemable	Total Equity
Balance, January 1, 2009	1,000	$—	$629,220	$ (5,336)	$(250)	$(6,670)	$12,208	$ 629,172
Net (loss) income	—	—	—	(9,550)	—	—	689	(8,861)
Unrealized gain on interest rate swap agreement, net of tax	—	—	—	—	—	1,938	—	1,938
Share of equity investee's other comprehensive loss, net of tax	—	—	—	—	—	(137)	—	(137)
Stock-based compensation	—	—	962	—	—	—	—	962
Sale of interest in a subsidiary	—	—	96	—	—	—	154	250
Payment of note receivable from shareholder	—	—	—	—	25	—	—	25
Equity contribution in joint venture	—	—	—	—	—	—	800	800
Cash distributions	—	—	—	—	—	—	(2,142)	(2,142)
Balance, December 31, 2009	1,000	$—	$630,278	$ (14,886)	$(225)	$(4,869)	$11,709	$ 622,007
Net (loss) income	—	—	—	(115,488)	—	—	691	(114,797)
Unrealized gain on interest rate swap agreement, net of tax	—	—	—	—	—	1,679	—	1,679
Share of equity investee's other comprehensive loss, net of tax	—	—	—	—	—	(201)	—	(201)
Issuance of limited liability company interests	—	—	156	—	—	—	—	156
Deconsolidation of a noncontrolling interest	—	—	—	—	—	—	(78)	(78)
Purchase of a noncontrolling interest in a joint venture	—	—	(475)	—	—	—	475	—
Stock-based compensation	—	—	1,030	—	—	—	—	1,030
Payment of note receivable from shareholder	—	—	—	—	50	—	—	50
Equity contribution in joint venture	—	—	—	—	—	—	608	608
Cash distributions	—	—	—	—	—	—	(2,246)	(2,246)
Balance, December 31, 2010	1,000	$—	$630,989	$(130,374)	$(175)	$(3,391)	$11,159	$ 508,208
Net (loss) income	—	—	—	(353,441)	—	—	2,767	(350,674)
Unrealized gain on interest rate swap agreement, net of tax	—	—	—	—	—	2,428	—	2,428
Foreign currency translation loss	—	—	—	—	—	(4,265)	(617)	(4,882)
Cash contribution of equity	—	—	3	—	—	—	—	3
Deconsolidation of a noncontrolling interest	—	—	—	—	—	—	49	49
Equity issuance related to MDLLC acquisition	25	—	16,250	—	—	—	—	16,250
Fair value of noncontrolling interest acquired in connection with MDLLC acquisition	—	—	—	—	—	—	7,750	7,750
Reversal of other comprehensive income of previously held equity investment	—	—	—	—	—	338	—	338
Stock-based compensation	—	—	1,461	—	—	—	—	1,461
Payment of note receivable from shareholder	—	—	—	—	50	—	—	50
Cash distributions	—	—	—	—	—	—	(3,687)	(3,687)
Balance, December 31, 2011	1,025	$—	$648,703	$(483,815)	$(125)	$(4,890)	$17,421	$ 177,294

The accompanying notes are an integral part of the consolidated financial statements.

(1) Organization and Basis of Presentation

Organization

Radiation Therapy Services Holdings, Inc. ("Parent"), through its wholly-owned subsidiaries (the "Subsidiaries" and, collectively with the Subsidiaries, the "Company") develops and operates radiation therapy centers that provide radiation treatment to cancer patients in Alabama, Arizona, California, Delaware, Florida, Kentucky, Maryland, Massachusetts, Michigan, Nevada, New Jersey, New York, North Carolina, Rhode Island, South Carolina and West Virginia. The Company also develops and operates radiation therapy centers in South America, Central America and the Caribbean. The international centers are located in Argentina, Mexico, Costa Rica, Dominican Republic, Guatemala and El Salvador. The Company also has affiliations with physicians specializing in other areas including urology and medical, gynecological, and surgical oncology in a number of markets to strengthen the Company's clinical working relationships.

(2) Summary of Significant Accounting Policies

Principles of Consolidation

The accompanying consolidated financial statements include the accounts of the Company and all subsidiaries and entities controlled by the Company through the Company's direct or indirect ownership of a majority interest and/or exclusive rights granted to the Company as the general partner of such entities. All significant intercompany accounts and transactions have been eliminated.

Variable Interest Entities

The Company has evaluated certain radiation oncology practices in order to determine if they are variable interest entities ("VIEs"). This evaluation resulted in the Company determining that certain of its radiation oncology practices were potential VIEs. For each of these practices, the Company has evaluated (1) the sufficiency of the fair value of the entity's equity investments at risk to absorb losses, (2) that, as a group, the holders of the equity investments at risk have (a) the direct or indirect ability through voting rights to make decisions about the entity's significant activities, (b) the obligation to absorb the expected losses of the entity and their obligations are not protected directly or indirectly, and (c) the right to receive the expected residual return of the entity, and (3) substantially all of the entity's activities do not involve or are not conducted on behalf of an investor that has disproportionately fewer voting rights in terms of its obligation to absorb the expected losses or its right to receive expected residual returns of the entity, or both. The Accounting Standards Codification (ASC), 810, *Consolidation* (ASC 810), requires a company to consolidate VIEs if the company is the primary beneficiary of the activities of those entities. Certain of the Company's radiation oncology practices are VIEs and the Company has a variable interest in each of these practices through its administrative services agreements. Other of the Company's radiation oncology practices (primarily consist of partnerships) are VIEs and the Company has a variable interest in each of these practices because the total equity investment at risk is not sufficient to permit the legal entity to finance its activities without the additional subordinated financial support provided by its members.

In accordance with ASC 810, the Company consolidates certain radiation oncology practices where the Company provides administrative services pursuant to long-term management agreements. The noncontrolling interests in these entities represent the interests of the physician owners of the oncology

(2) Summary of Significant Accounting Policies (Continued)

practices in the equity and results of operations of these consolidated entities. The Company, through its variable interests in these practices, has the power to direct the activities of these practices that most significantly impact the entity's economic performance and the Company would absorb a majority of the expected losses of these practices should they occur. Based on these determinations, the Company has consolidated these radiation oncology practices in its consolidated financial statements for all periods presented.

The Company could be obligated, under the terms of the operating agreements governing certain of its joint ventures, upon the occurrence of various fundamental regulatory changes and or upon the occurrence of certain events outside of the Company's control to purchase some or all of the noncontrolling interests related to the Company's consolidated subsidiaries. These repurchase requirements would be triggered by, among other things, regulatory changes prohibiting the existing ownership structure. While the Company is not aware of events that would make the occurrence of such a change probable, regulatory changes are outside the control of the Company. Accordingly, the noncontrolling interests subject to these repurchase provisions have been classified outside of equity on the Company's consolidated balance sheets.

All significant intercompany accounts and transactions have been eliminated. As of December 31, 2011 and 2010, the combined total assets included in the Company's balance sheet relating to the VIEs were approximately $73.5 and $71.1 million, respectively.

As of December 31, 2011, the Company was the primary beneficiary of, and therefore consolidated, 24 VIEs, which operate 44 centers. Any significant amounts of assets and liabilities related to the consolidated VIEs are identified parenthetically on the accompanying consolidated balance sheets. The assets are owned by, and the liabilities are obligations of the VIEs, not the Company. Only the VIE's assets can be used to settle the liabilities of the VIE. The assets are used pursuant to operating agreements established by each VIE. The VIEs are not guarantors of the Company's debts. In the states of California, Delaware, Massachusetts, Michigan, Nevada, New York and North Carolina, the Company's treatment centers are operated as physician office practices. The Company typically provides technical services to these treatment centers in addition to administrative services. For the years ended December 31, 2011, 2010 and 2009 approximately 18.0%, 22.1% and 23.6% of the Company's net patient service revenue, respectively, was generated by professional corporations with which it has administrative services agreements.

As of December 31, 2011, the Company also held equity interests in seven VIEs for which the Company is not the primary beneficiary. Those VIEs consist of partnerships that primarily provide radiation oncology services. The Company is not the primary beneficiary of these VIEs as it does not retain the power and rights in the operations of the entities. The Company's investments in the unconsolidated VIEs are approximately $0.7 million and $20.1 million at December 31, 2011 and December 31, 2010, respectively, with ownership interests ranging between 28.5% and 50% general partner or equivalent interest. Accordingly, substantially all of these equity investment balances are attributed to the Company's noncontrolling interests in the unconsolidated partnerships. The Company's maximum risk of loss related to the investments in these VIEs is limited to the equity interest.

(2) Summary of Significant Accounting Policies (Continued)

Net Patient Service Revenue and Allowances for Contractual Discounts

The Company has agreements with third-party payers that provide for payments to the Company at amounts different from its established rates. Net patient service revenue is reported at the estimated net realizable amounts due from patients, third-party payers and others for services rendered. Net patient service revenue is recognized as services are provided.

Medicare and other governmental programs reimburse physicians based on fee schedules, which are determined by the related government agency. The Company also has agreements with managed care organizations to provide physician services based on negotiated fee schedules. Accordingly, the revenues reported in the Company's consolidated financial statements are recorded at the amount that is expected to be received.

The Company derives a significant portion of its revenues from Medicare, Medicaid, and other payers that receive discounts from its standard charges. The Company must estimate the total amount of these discounts to prepare its consolidated financial statements. The Medicare and Medicaid regulations and various managed care contracts under which these discounts must be calculated are complex and subject to interpretation and adjustment. The Company estimates the allowance for contractual discounts on a payer class basis given its interpretation of the applicable regulations or contract terms. These interpretations sometimes result in payments that differ from the Company's estimates. Additionally, updated regulations and contract renegotiations occur frequently necessitating regular review and assessment of the estimation process by management.

On an annual basis the Company performs a hindsight analysis in reviewing estimates to its contractual adjustments and bad debt allowance. The Company's review of the estimates are based on a full year look-back of actual adjustments taken in the calculation of the contractual allowance and bad debt allowance. Adjustments to revenue related to changes in prior period estimates increased net patient service revenue by approximately $1.8 million for the year ended December 31, 2011, or approximately 0.3% of the net patient service revenue and decreased net patient service revenue by approximately $0.4 million, and $6.0 million for years ended December 31, 2010 and 2009, respectively, or approximately 0.1%, and 1.2%, of the net patient service revenue for each of the respective periods.

For the years ended December 31, 2011, 2010, and 2009, approximately 48%, 48%, and 44%, respectively, of net patient service revenue related to services rendered under the Medicare and Medicaid programs. In the ordinary course of business, the Company is potentially subject to a review by regulatory agencies concerning the accuracy of billings and sufficiency of supporting documentation of procedures performed. Laws and regulations governing the Medicare and Medicaid programs are extremely complex and subject to interpretation. As a result, there is a possibility that such estimates will change by a significant amount in the near term.

Net patient service revenue is presented net of provisions for contractual adjustments. In the ordinary course of business, the Company provides services to patients who are financially unable to pay for their care. Accounts written off as charity and indigent care are not recognized in net patient service revenue. The Company's policy is to write off a patient's account balance upon determining that the patient qualifies under certain charity care and/or indigent care policies. The Company's policy includes the completion of an application for eligibility for charity care. The determination for charity care eligibility is based on income relative to federal poverty guidelines, family size, and assets available

(2) Summary of Significant Accounting Policies (Continued)

to the patient. A sliding scale discount is then applied to the balance due with discounts up to 100%. The Company estimates the costs of charity care services it provides by developing a ratio of foregone charity care revenues compared to total revenues and applying that ratio to the costs of providing services. Costs of providing services includes select direct and indirect costs such as salaries and benefits, medical supplies, facility rent expenses, other operating expenses, general and administrative expenses, depreciation and amortization, provision for doubtful accounts, and interest expense. The Company's estimated cost to provide charity care services is approximately $13.1 million, $10.7 million, and $12.4 million for the years ended December 31, 2011, 2010, and 2009, respectively. Funds received to offset or subsidize charity services provided were approximately $0.7 million, $1.0 million, and $1.0 million for the years ended December 31, 2011, 2010, and 2009, respectively.

Cost of Revenues

The cost of revenues for the years ended December 31, 2011, 2010, and 2009, are approximately $419.8 million, $364.4 million, and $331.9 million, respectively.

Accounts Receivable and Allowances for Doubtful Accounts

Accounts receivable in the accompanying consolidated balance sheets are reported net of estimated allowances for doubtful accounts and contractual adjustments. Accounts receivable are uncollateralized and primarily consist of amounts due from third-party payers and patients. To provide for accounts receivable that could become uncollectible in the future, the Company establishes an allowance for doubtful accounts to reduce the carrying value of such receivables to their estimated net realizable value. Approximately $28.3 million and $23.0 million of accounts receivable were due from the Medicare and Medicaid programs at December 31, 2011 and 2010, respectively. The credit risk for any other concentrations of receivables is limited due to the large number of insurance companies and other payers that provide payments for services. Management does not believe that there are other significant concentrations of accounts receivable from any particular payer that would subject the Company to any significant credit risk in the collection of its accounts receivable.

The allowance for doubtful accounts is based upon management's assessment of historical and expected net collections, business and economic conditions, trends in federal and state governmental health care coverage, and other collection indicators. The primary tool used in management's assessment is an annual, detailed review of historical collections and write-offs of accounts receivable. The results of the detailed review of historical collections and write-off experience, adjusted for changes in trends and conditions, are used to evaluate the allowance amount for the current period. Accounts receivable are written off after collection efforts have been followed in accordance with the Company's policies.

Adjustments to bad debt expense related to changes in prior period estimates increased bad debt expense by approximately $1.1 million, for the year ended December 31, 2011 and decreased bad debt expense by approximately $4.5 million, and $3.8 million for the years ended December 31, 2010 and 2009, respectively.

(2) Summary of Significant Accounting Policies (Continued)

A summary of the activity in the allowance for doubtful accounts is as follows:

(in thousands):	Year ended December 31, 2011	2010	2009
Balance, beginning of period	$ 20,936	$ 26,352	$ 26,233
Acquisitions	1,855	—	—
Additions charged to provision for doubtful accounts	16,117	8,831	12,871
Deconsolidation of a noncontrolling interest	36	(113)	—
Accounts receivable written off, net of recoveries	(13,643)	(14,134)	(12,752)
Foreign currency translation	(259)	—	—
Balance, end of period	$ 25,042	$ 20,936	$ 26,352

Goodwill and Other Intangible Assets

The Company's policy is to evaluate indefinite-lived intangible assets and goodwill for possible impairment at least annually at October 1, or whenever events or changes in circumstances indicate that the carrying amount of such assets may not be recoverable. An intangible asset with an indefinite life (a major trade name) is evaluated for possible impairment by comparing the fair value of the asset with its carrying value. Fair value is estimated as the discounted value of future revenues arising from a trade name using a royalty rate that an independent party would pay for use of that trade name. An impairment charge is recorded if the trade name's carrying value exceeds its estimated fair value. Goodwill is evaluated for possible impairment by comparing the fair value of a reporting unit with its carrying value, including goodwill assigned to that reporting unit. Fair value of a reporting unit is estimated using a combination of income-based and market-based valuation methodologies. Under the income approach, forecasted cash flows of a reporting unit are discounted to a present value using a discount rate commensurate with the risks of those cash flows. Under the market approach, the fair value of a reporting unit is estimated based on the revenues and earnings multiples of a group of comparable public companies and from recent transactions involving comparable companies. An impairment charge is recorded if the carrying value of the goodwill exceeds its implied fair value.

Goodwill represents the excess purchase price over the estimated fair value of net assets acquired by the Company in business combinations. Goodwill and indefinite life intangible assets are not amortized, but are reviewed annually for impairment, or more frequently if impairment indicators arise. Goodwill impairment was recognized for the years ended December 31, 2011 and 2010 of approximately $298.3 million and $91.2 million, respectively. No goodwill impairment loss was recognized for the year ended December 31, 2009.

Intangible assets consist of trade names (indefinite life and amortizable), noncompete agreements, hospital contracts and licenses. Indefinite life trade names are tested at least annually for impairment. Amortizable trade names are amortized over the life of the trade name of approximately 15 months. Noncompete agreements, hospital contracts and licenses are amortized over the life of the agreement (which typically ranges from 2 to 20 years) using the straight-line method. Intangible asset impairment loss was recognized for the year ended December 31, 2011 of approximately $58.2 million relating to

(2) Summary of Significant Accounting Policies (Continued)

the Company's trade name and the Company's rebranding initiatives. No intangible asset impairment loss was recognized for the years ended December 31, 2010 and 2009.

Derivative Agreements

The Company recognizes all derivatives in the consolidated balance sheets at fair value. The accounting for changes in the fair value (i.e., gains or losses) of a derivative instrument depends on whether it has been designated and qualifies as part of a hedging relationship based on its effectiveness in hedging against the exposure. Derivatives that do not meet hedge accounting requirements must be adjusted to fair value through operating results. If the derivative meets hedge accounting requirements, depending on the nature of the hedge, changes in the fair value of derivatives are either offset against the change in fair value of assets, liabilities, or firm commitments through operating results or recognized in other comprehensive income (loss) until the hedged item is recognized in operating results. The ineffective portion of a derivative's change in fair value is immediately recognized in earnings.

Interest rate swap agreements

The Company enters into interest rate swap agreements to reduce the impact of changes in interest rates on its floating rate senior secured credit facility. The interest rate swap agreements are contracts to exchange floating rate interest payments for fixed interest payments over the life of the agreements without the exchange of the underlying notional amounts. The notional amounts of interest rate swap agreements are used to measure interest to be paid or received and do not represent the amount of exposure to credit loss. The differential paid or received on interest rate swap agreements is recognized in interest expense in the consolidated statements of operations and comprehensive loss. The related accrued payable is included in other long term liabilities at December 31, 2011 and 2010.

On May 27, 2008, the Company entered into an interest rate swap agreement for its $407.0 million of floating rate senior debt governed by the Credit Agreement dated February 21, 2008 (senior secured credit facility). The Company designated this derivative financial instrument as a cash flow hedge (i.e., the interest rate swap agreement hedges the exposure to variability in expected future cash flows that is attributable to interest rate risk). The initial notional amount of the swap agreement was $290.6 million with amounts scaling down during various quarters throughout the term of the interest rate swap agreement to $116.0 million. The effect of this agreement is to fix the interest rate exposure to 3.67% plus a margin on $116.0 million of the Company's senior secured credit facility. The interest rate swap agreement expires on March 30, 2012. In December 2011, the Company terminated the interest rate swap agreement and paid approximately $1.9 million representing the fair value of the interest rate hedge at time of termination. No ineffectiveness was recorded as a result of the termination of the interest rate swap agreement. The amount of accumulated other comprehensive loss related to the terminated interest swap agreement of approximately $84,000 will be amortized through interest expense through the original term of the interest rate swap agreement through March 30, 2012. At December 31, 2011 no amount of the floating rate senior debt was subject to an interest rate swap. At December 31, 2010, the amount of the floating rate senior debt subject to the interest rate swap was $174.2 million.

(2) Summary of Significant Accounting Policies (Continued)

In July 2011, the Company entered into two interest rate swap agreements whereby the Company fixed the interest rate on the notional amounts totaling approximately $116.0 million of the Company's senior secured term credit facility, effective as of March 30, 2012. The rate and maturity of the interest rate swap agreements are 0.923% plus a margin, which is currently 475 basis points, and expires on December 31, 2013.

The swaps are derivatives and are accounted for under ASC 815, *"Derivatives and Hedging"* ("ASC 815"). The fair value of the swap agreements, representing the estimated amount that the Company would pay to a third party assuming the Company's obligations under the interest rate swap agreements terminated at December 31, 2011 and 2010, was approximately $0.7 million and $5.0 million, respectively, which is included in other long term liabilities in the accompanying consolidated balance sheets. The estimated fair value of our interest rate swap was determined using the income approach that considers various inputs and assumptions, including LIBOR swap rates, cash flow activity, yield curves and other relevant economic measures, all of which are observable market inputs that are classified under Level 2 of the fair value hierarchy. The fair value also incorporates valuation adjustments for credit risk. No ineffectiveness was recorded at December 31, 2011.

Since the Company has the ability to elect different interest rates on the debt at each reset date, and the senior secured credit facility contains certain prepayment provisions, the hedging relationships do not qualify for use of the shortcut method under ASC 815. Therefore, the effectiveness of the hedge relationship is assessed on a quarterly basis during the life of the hedge through regression analysis. The entire change in fair market value is recorded in equity, net of tax, as other comprehensive income (loss).

Foreign currency derivative contracts

Foreign currency risk is the risk that fluctuations in foreign exchange rates could impact the Company's results from operations. The Company is exposed to a significant amount of foreign exchange risk, primarily between the U.S. dollar and the Argentine peso. This exposure relates to the provision of radiation oncology services to patients at the Company's Latin American operations and purchases of goods and services in foreign currencies. On March 18, 2011, the Company entered into foreign exchange option contracts expiring at the end of the four consecutive quarterly periods beginning April 1, 2011 to convert a significant portion of the Company's forecasted foreign currency denominated net income into U.S. dollars to limit the adverse impact of a potential weakening Argentine peso against the U.S. dollar. On December 21, 2011 the Company entered into a foreign exchange option contract maturing on December 28, 2012 to replace the contract maturing on December 30, 2011. Because the Company's Argentine forecasted foreign currency denominated net income is expected to increase commensurate with inflationary expectations, any adverse impact on net income from a weakening Argentine peso against the U.S. dollar is limited to the cost of the option contracts, which was approximately $1.2 million in aggregate at inception of the contracts. Under the Company's foreign currency management program, the Company expects to monitor foreign exchange rates and periodically enter into forward contracts and other derivative instruments. Currently, the Company is targeting to cover approximately 70% of its forecasted Latin American operating income over the next twelve months through the use of forward contracts and other derivatives with the actual

(2) Summary of Significant Accounting Policies (Continued)

percentage determined by management based on the changing exchange rate environment. The Company does not use derivative financial instruments for speculative purposes.

These programs reduce, but do not entirely eliminate, the impact of currency exchange movements. The Company's current practice is to use currency derivatives without hedge accounting designation. The maturity of these instruments generally occurs within twelve months. Gains or losses resulting from the fair valuing of these instruments are reported in (gain) loss on forward currency derivative contracts on the consolidated statements of comprehensive loss. For the year ended December 31, 2011 the Company incurred a loss of approximately $672,000 relating to foreign currency derivative program. The fair value of the foreign currency derivative is recorded in other current assets in the accompanying consolidated balance sheet. At December 31, 2011, the fair value of the foreign currency derivative was approximately $814,000.

The following represents the current foreign currency derivative agreements as of December 31, 2011 (in thousands):

Foreign Currency Derivative Agreements (in thousands):	Notional Amount	Maturity Date	Premium Amount	Fair Value
Foreign currency derivative Argentine peso to U.S. dollar	$ 3,500	March 30, 2012	$ 228	$ 68
Foreign currency derivative Argentine peso to U.S. dollar	3,500	June 29, 2012	193	200
Foreign currency derivative Argentine peso to U.S. dollar	4,250	September 28, 2012	350	249
Foreign currency derivative Argentine peso to U.S. dollar	3,750	December 28, 2012	390	297
	$15,000		$1,161	$814

Professional and General Liability Claims

The Company is subject to claims and legal actions in the ordinary course of business, including claims relating to patient treatment, employment practices, and personal injuries. To cover these types of claims, the Company maintains general liability and professional liability insurance in excess of self-insured retentions through commercial insurance carriers in amounts that the Company believes to be sufficient for its operations, although, potentially, some claims may exceed the scope of coverage in effect. The Company expenses an estimate of the costs it expects to incur under the self-insured retention exposure for general and professional liability claims. The Company maintains insurance for the majority of its physicians up to $1 million on individual malpractice claims and $3 million on aggregate claims on a claims-made basis. The Company purchases medical malpractice insurance from an insurance company partially owned by a related party. The Company's reserves for professional and general liability claims are based upon independent actuarial calculations, which consider historical claims data, demographic considerations, severity factors, industry trends, and other actuarial assumptions.

(2) Summary of Significant Accounting Policies (Continued)

Actuarial calculations include a large number of variables that may significantly impact the estimate of ultimate losses that are recorded during a reporting period. Professional judgment is used by the actuary in determining the loss estimate, by selecting factors that are considered appropriate by the actuary for the Company's specific circumstances. Changes in assumptions used by the Company's actuary with respect to demographics, industry trends, and judgmental selection of factors may impact the Company's recorded reserve levels.

The amount accrued for professional and general liability claims as of the consolidated balance sheet dates reflects the current estimates of all outstanding losses, including incurred but not reported losses, based upon actuarial calculations. The loss estimates included in the actuarial calculations may change in the future based upon updated facts and circumstances. The amount accrued for professional liability claims was $1.3 million at December 31, 2010. In accordance with the adoption of ASU 2010-24, amounts accrued for reported claims as of December 31, 2011 total approximately $7.4 million. Of the approximate $7.4 million, approximately $3.1 million is recorded as other current liabilities and approximately $4.3 million is reported as other long-term liabilities. In addition the Company has recorded estimated insurance recoveries totaling approximately $7.4 million as of December 31, 2011. Of the approximate $7.4 million of estimated insurance recoveries, approximately $3.1 million is recorded as other current assets and approximately $4.3 million is reported as other long-term assets.

Noncontrolling Interest in Consolidated Entities

The Company currently maintains equity interests in 9 treatment center facilities with ownership interests ranging from 51.0% to 90.0%. Since the Company controls more than 50% of the voting interest in these facilities, the Company consolidates these treatment centers. The noncontrolling interests represent the equity interests of outside investors in the equity and results of operations of these consolidated entities.

In addition, in accordance with ASC 810, *Consolidation*, the Company consolidates certain radiation oncology practices where the Company provides administrative services pursuant to long-term management agreements. The noncontrolling interests in these entities represent the interests of the physician owners of the oncology practices in the equity and results of operations of these consolidated entities.

On January 1, 2009, the Company adopted changes issued by the Financial Accounting Standards Board ("FASB") to the accounting for noncontrolling interests in consolidated financial statements. These changes require, among other items, that a noncontrolling interest be included within equity separate from the parent's equity; consolidated net income be reported at amounts inclusive of both the parent's and noncontrolling interest's shares; and, separately, the amounts of consolidated net income attributable to the parent and noncontrolling interest all be reported on the consolidated statements of operations and comprehensive loss.

The Company could be obligated, under the terms of the operating agreements governing certain of its joint ventures, upon the occurrence of various fundamental regulatory changes and/or upon the occurrence of certain events outside of the Company's control to purchase some or all of the noncontrolling interests related to the Company's consolidated subsidiaries. These repurchase

(2) Summary of Significant Accounting Policies (Continued)

requirements would be triggered by, among other things, regulatory changes making the existing ownership structure illegal. While the Company is not aware of events that would make the occurrence of such a change probable, regulatory changes are outside the control of the Company. Accordingly, the noncontrolling interests subject to these repurchase provisions have been classified outside of equity on the Company's consolidated balance sheets.

Use of Estimates

The preparation of these consolidated financial statements in conformity with accounting principles generally accepted in the United States requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities at the date of the consolidated financial statements. Estimates also affect the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

Cash and Cash Equivalents

Cash and cash equivalents include highly liquid investments with original maturities of three months or less when purchased.

Inventories

Inventories consist of parts and supplies used for repairs and maintenance of equipment owned or leased by the Company and medical drugs used for patient care services as follows:

(in thousands):	December 31, 2011	December 31, 2010
Parts and supplies	$1,481	$1,426
Medical drugs	2,827	1,221
	$4,308	$2,647

Inventories are valued at the lower of cost or market. The cost of parts and supplies and medical drugs are determined using the first-in, first-out method.

Property and Equipment

Property and equipment are recorded at historical cost less accumulated depreciation and are depreciated over their estimated useful lives utilizing the straight-line method. Leasehold improvements are amortized over the lesser of the estimated useful life of the improvement or the life of the lease. Amortization of leased assets is included in depreciation and amortization in the accompanying consolidated statements of operations and comprehensive loss. Expenditures for repairs and maintenance are charged to operating expense as incurred, while equipment replacement and betterments are capitalized.

(2) Summary of Significant Accounting Policies (Continued)

Major asset classifications and useful lives are as follows:

Buildings and leasehold improvements	10 - 50 years
Office, computer, and telephone equipment	3 - 10 years
Medical and medical testing equipment	5 - 10 years
Automobiles and vans	5 years

The weighted-average useful life of medical and medical testing equipment is 9.3 years and 9.5 years in 2011 and 2010, respectively.

The Company evaluates its long-lived assets for possible impairment whenever circumstances indicate that the carrying amount of the asset, or related group of assets, may not be recoverable from estimated future cash flows, in accordance with ASC 360, *Property, Plant, and Equipment*. Fair value estimates are derived from independent appraisals, established market values of comparable assets, or internal calculations of estimated future net cash flows. The Company's estimates of future cash flows are based on assumptions and projections it believes to be reasonable and supportable for a market.

Recent Pronouncements

In August 2010, the FASB issued ASU 2010-23, *Health Care Entities (Topic 954): Measuring Charity Care for Disclosure* (ASU 2010-23), which amends ASC 954 to require that cost be used as the measurement basis for charity care disclosure purposes and that cost be identified as the direct and indirect costs of providing the charity care. The Company has historically measured charity care services by identifying the foregone patient charges associated with the provision of those services. The Company adopted ASU 2010-23 on January 1, 2011. The cost of charity care services is measured by developing a ratio of costs as compared to gross charges and applying the resulting ratio against gross charges associated with charity care patient services.

In August 2010, the FASB issued ASU 2010-24, *Health Care Entities (Topic 954): Presentation of Insurance Claims and Related Insurance Recoveries* (ASU 2010-24), which amends ASC 954 to clarify that a health care entity cannot net insurance recoveries against a related claim liability. The Company adopted ASU 2010-24 on January 1, 2011. As a result, the Company recorded current claims liabilities totaling $2.2 million in other current liabilities; non-current claims liabilities totaling $2.3 million in other non-current liabilities; current claims insurance recoveries totaling $2.2 million in other current assets; and non-current claims insurance recoveries totaling $2.3 million in other non-current assets. The adoption of ASU 2010-24 did not have any impact to the consolidated statements of comprehensive loss and was not applied retrospectively to December 31, 2010.

In May 2011, the FASB issued ASU 2011-04, *Fair Value Measurement (Topic 820): Amendments to Achieve Common Fair Value Measurement and Disclosure Requirements in U.S. GAAP and International Financial Reporting Standards*, (ASU 2011-04), which amends the *FASB Accounting Standards Codification* to provide a consistent definition of fair value and ensure that the fair value measurement and disclosure requirements are similar between U.S. GAAP and International Financial Reporting Standards. ASU 2011-04 changes certain fair value measurement principles and enhances the disclosure requirements particularly for level 3 fair value measurements. ASU 2011-04 is applied prospectively. The amendments are effective for fiscal years, and interim period within those years, beginning after

(2) Summary of Significant Accounting Policies (Continued)

December 15, 2011, and as such we will adopt ASU 2011-04 on January 1, 2012. The Company is currently evaluating the impact of its pending adoption of ASU 2011-04 on the consolidated financial statements and accompanying notes.

In June 2011, the FASB issued ASU 2011-05, *Comprehensive Income (Topic 220): Presentation of Comprehensive Income*, (ASU 2011-05). ASU 2011-05 amends the *FASB Accounting Standards Codification* to allow an entity the option to present the total of comprehensive income, the components of net income, and the components of other comprehensive income either in a single continuous statement of comprehensive income or in two separate but consecutive statements. In both choices, an entity is required to present each component of net income along with the total net income, each component of other comprehensive income along with a total for other comprehensive income, and a total amount for comprehensive income. ASU 2011-05 eliminates the option to present the components of other comprehensive income as part of the statement of changes in stockholders' equity. The amendments to the Codification in the ASU do not change the items that must be reported in other comprehensive income or when an item of other comprehensive income must be reclassified to net income. ASU 2011-05 should be applied retrospectively. The amendments are effective for fiscal years, and interim period within those years, beginning after December 15, 2011. The Company adopted ASU 2011-05 in its 2011 consolidated financial statements.

In July 2011, the FASB issued ASU 2011-07, *Health Care Entities (Topic 954): Presentation and Disclosure of Patient Service Revenue, Provision for Bad Debts, and the Allowance for Doubtful Accounts for Certain Health Care Entities,* (ASU 2011-07). ASU 2011-07 amends the *FASB Accounting Standards Codification* to require health care entities that recognize significant amounts of patient service revenue at the time services are rendered even though they do not assess the patient's ability to pay to present the provision for bad debts related to patient service revenue as a deduction from patient service revenue (net of contractual allowances and discounts) on their statement of operations. Additionally, those health care entities are required to provide enhanced disclosure about their policies for recognizing revenue and assessing bad debts. The amendments also require disclosures of patient service revenue (net of contractual allowances and discounts) as well as qualitative and quantitative information about changes in the allowance for doubtful accounts. ASU 2011-07 is applied retrospectively and disclosures relating to ASU 2011-07 are applied prospectively. The amendments are effective for fiscal years, and interim period within those years, beginning after December 15, 2011. The Company is currently evaluating the impact of ASU 2011-07 on its consolidated financial statements.

Advertising Costs

Advertising costs are charged to general and administrative expenses as incurred and amounted to approximately $3.6 million, $2.0 million and $1.8 million, for the years ended December 31, 2011, 2010, and 2009, respectively.

Comprehensive Loss

Comprehensive loss consists of two components, net loss and other comprehensive income (loss). Other comprehensive income (loss) refers to revenue, expenses, gains, and losses that under accounting principles generally accepted in the United States are recorded as an element of equity but are excluded from net loss. The Company's other comprehensive income (loss) is composed of unrealized

(2) Summary of Significant Accounting Policies (Continued)

gains and losses on interest rate swap agreements accounted for as cash flow hedges and the Company's foreign currency translation of its operations in South America, Central America and the Caribbean. The impact of the unrealized net loss decreased total equity on a consolidated basis by approximately $2.5 million for the year ended December 31, 2011 and the impact of unrealized net gain increased total equity on a consolidated basis by approximately $1.5 million and $1.8 million for the years ended December 31, 2010 and 2009, respectively.

Accumulated Other Comprehensive Loss. The components of accumulated other comprehensive income (loss) were as follows (in thousands):

	Radiation Therapy Services Holdings, Inc. Shareholder				Noncontrolling Interests	
(in thousands):	Foreign Currency Translation Adjustments	Derivative Losses on Interest Rate Swap Agreements	Other	Total	Foreign Currency Translation Adjustments	Other Comprehensive Income (Loss)
Year ended December 31, 2008	$ —	$(6,670)	$ —	$(6,670)	$ —	
Other Comprehensive income (loss)	—	2,978	(137)	2,841	—	$ 2,841
Income tax expense	—	(1,040)	—	(1,040)	—	(1,040)
Year ended December 31, 2009	—	(4,732)	(137)	(4,869)	—	1,801
Other Comprehensive income (loss)	—	2,730	(201)	2,529	—	2,529
Income tax expense	—	(1,051)	—	(1,051)	—	(1,051)
Year ended December 31, 2010	—	(3,053)	(338)	(3,391)	—	1,478
Other Comprehensive (loss) income	(4,265)	2,377	—	(1,888)	(644)	(2,532)
Income tax benefit	—	51	—	51	—	51
Reversal of previously held equity investment	—	—	338	338	—	—
Year ended December 31, 2011	$(4,265)	$ (625)	$ —	$(4,890)	$(644)	$(2,481)

Income Taxes

The Company provides for federal, foreign and state income taxes currently payable, as well as for those deferred due to timing differences between reporting income and expenses for financial statement purposes versus tax purposes. Deferred tax assets and liabilities are recognized for the future tax consequences attributable to temporary differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases. Deferred tax assets and liabilities are measured using enacted income tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. The effect of a change in income tax rates is recognized as income or expense in the period that includes the enactment date.

ASC 740, *Income Taxes* (ASC 740), clarifies the accounting for uncertainty in income taxes recognized in an entity's financial statements and prescribes a recognition threshold and measurement attributes for financial statement disclosure of tax positions taken or expected to be taken on a tax return. Under ASC 740, the impact of an uncertain tax position on the income tax return must be recognized at the largest amount that is more-likely-than-not to be sustained upon audit by the relevant

(2) Summary of Significant Accounting Policies (Continued)

taxing authority. An uncertain income tax position will not be recognized if it has less than a 50% likelihood of being sustained. Additionally, ASC 740, provides guidance on derecognition, classification, interest and penalties, accounting in interim periods, disclosure, and transition.

Stock-Based Compensation

Radiation Therapy Investments, LLC ("RT Investments") adopted an equity-based incentive plan in February 2008, and issued units of limited liability company interests designated Class B Units and Class C Units pursuant to such plan. The units are limited liability company interests and are available for issuance to the Company's employees and members of the Board of Directors for incentive purposes. For purposes of determining the compensation expense associated with these grants, management valued the business enterprise using a variety of widely accepted valuation techniques, which considered a number of factors such as the financial performance of the Company, the values of comparable companies and the lack of marketability of the Company's equity at grant date. The Company then used the option pricing method to determine the fair value of these units at the time of grant using valuation assumptions consisting of the expected term in which the units will be realized; a risk-free interest rate equal to the U.S. federal treasury bond rate consistent with the term assumption; expected dividend yield, for which there is none; and expected volatility based on the historical data of equity instruments of comparable companies. The Class B units vest over a four-year service period. The Class C units vest based on certain performance measures or market conditions being met or achieved. The estimated fair value of the units, less an assumed forfeiture rate, are recognized in expense on a straight-line basis over the requisite service periods of the awards for the Class B units and the accelerated attribution method approach is utilized for the Class C units.

Fair Value of Financial Instruments

The carrying values of the Company's financial instruments, which include cash and cash equivalents, accounts receivable and accounts payable approximate their fair values due to the short-term maturity of these instruments.

The carrying values of the Company's long-term debt approximates fair value due either to the length to maturity or the existence of interest rates that approximate prevailing market rates unless otherwise disclosed in these consolidated financial statements.

Segments

The Company operates in one line of business, which is operating physician group practices. As of March 1, 2011, due to the acquisition of MDLLC and Clinica de Radioterapia La Asuncion S.A., the Company's operations are structured into two geographically organized groups: the Domestic U.S. includes 96 treatment centers and International includes 31 treatment centers. The Company assesses performance of and makes decisions on how to allocate resources to its operating segments based on multiple factors including current and projected facility gross profit and market opportunities.

Reclassifications

Certain reclassifications totaling approximately $1.2 million to increase inventories and decrease other assets-current have been made to the consolidated balance sheet at December 31, 2010. This reclassification had no effect on previously reported total assets, equity, net loss, or comprehensive loss.

(3) Property and Equipment

Property and equipment consist of the following:

(in thousands):	December 31, 2011	December 31, 2010
Land	$ 1,770	$ 1,770
Buildings and leasehold improvements	56,642	51,156
Office, computer, and telephone equipment	63,485	43,492
Medical and medical testing equipment	236,041	214,712
Automobiles and vans	1,450	1,246
	359,388	312,376
Less accumulated depreciation	(126,742)	(84,202)
	232,646	228,174
Construction-in-progress	3,946	1,491
Foreign currency translation	(181)	—
	$ 236,411	$229,665

During the fourth quarter of 2011 and 2010, the Company impaired certain leasehold improvements and other fixed assets of approximately $0.8 million and $3.5 million, respectively for planned closings of certain offices in California, Maryland and Michigan.

(4) Capital Lease Arrangements

The Company leases certain equipment under agreements, which are classified as capital leases. These leases have bargain purchase options at the end of the original lease terms. Capital leased assets included in property and equipment are as follows:

(in thousands):	December 31, 2011	December 31, 2010
Medical equipment	$ 44,495	$ 38,309
Software	812	—
Less: accumulated amortization	(12,854)	(10,917)
	$ 32,453	$ 27,392

Amortization expense relating to capital leased equipment was approximately $4.4 million, $4.1 million, and $4.4 million for the years ended December 31, 2011, 2010 and 2009, respectively, and is included in depreciation expense in the consolidated statements of comprehensive loss.

(5) Goodwill and Intangible Assets

2011

As disclosed during the second quarter of 2011, certain of the Company's regions' patient volume had stabilized in their respective markets. Although the Company had a stabilization of patient volume, the Company was reviewing its anticipated growth expectations in certain of the reporting units and

(5) Goodwill and Intangible Assets (Continued)

was considering whether it was necessary to adjust expectations for the remainder of the year. During the third quarter of 2011, Company determined that its previously projected cash flows for certain of its reporting units were not likely to be achieved and as a result revised these estimated cash flows and obtained a valuation analysis and appraisal to enable the Company to determine if all or a portion of the recorded goodwill or any portion of other long-lived assets were impaired. The reporting units affected were affected by the deterioration in the housing market and the continued high unemployment rates, as well as the local economic conditions in the communities the Company serves.

During the third quarter of 2011, the Company completed an interim impairment test for goodwill and indefinite-lived intangible assets as a result of its review of growth expectations and the release of the final rule issued on the physician fee schedule for 2012 and 2013 by the Centers for Medicare and Medicaid Services ("CMS"), the government agency responsible for administering the Medicare program, on November 1, 2011, which included certain rate reductions on Medicare payments to freestanding radiation oncology providers. In performing this test, the Company assessed the implied fair value of its goodwill and intangible assets. It was determined that the implied fair value of goodwill and/or indefinite-lived intangible assets was less than the carrying amount, and as a result the Company recorded an impairment charge. The implied fair value of goodwill was determined in the same manner as the amount of goodwill recognized in a business combination. The estimated fair value of the reporting unit was allocated to all of the assets and liabilities of the reporting unit (including the unrecognized intangible assets) as if the reporting unit had been acquired in a business combination and the estimated fair value of the reporting unit was the purchase price paid. Based on (i) assessment of current and expected future economic conditions, (ii) trends, strategies and forecasted cash flows at each reporting unit and (iii) assumptions similar to those that market participants would make in valuing the Company's reporting units, the Company's management determined that the carrying value of goodwill and trade name in certain U.S. Domestic markets, including North East United States (New York, Rhode Island, Massachusetts and southeast Michigan), California, South West United States (central Arizona and Las Vegas, Nevada), the Florida east coast, Northwest Florida and Southwest Florida regions exceeded their fair value. Accordingly, the Company recorded noncash impairment charges in the U.S. Domestic reporting segment totaling $234.9 million in the consolidated statement of comprehensive loss during the third quarter of 2011.

Impairment charges relating to goodwill and trade name during the third quarter of 2011 are summarized as follows:

(in thousands):	North East U.S.	California	South West U.S.	Florida East Coast	Northwest Florida	Southwest Florida	Total
Goodwill	$13,412	$10,236	$45,127	$32,963	$40,026	$84,751	$226,515
Trade name	$ 258	$ 982	$ 4,049	$ —	$ 969	$ 2,152	$ 8,410

During the fourth quarter of 2011, the Company decided to rebrand its current trade name of 21st Century Oncology. As a result of the rebranding initiative and concurrent with the Company's annual impairment test for goodwill and indefinite-lived intangible assets, the Company incurred an impairment loss of approximately $121.6 million. Approximately $49.8 million of the $121.6 million related to the trade name impairment as a result of the rebranding initiative. The remaining $71.8 million of impairment was related to goodwill in certain of the Company's reporting units, including

(5) Goodwill and Intangible Assets (Continued)

North East United States, (New York, Rhode Island, Massachusetts and southeast Michigan), and California, Southwest U.S. (Arizona and Nevada). The remaining domestic U.S. trade name of approximately $4.6 million will be amortized over its remaining useful life through December 31, 2012. The Company incurred approximately $0.9 million in amortization expense during the fourth quarter.

Impairment charges relating to goodwill and trade name during the fourth quarter of 2011 are summarized as follows:

(in thousands):	North East U.S.	Mid East U.S.	Central South East U.S.	California	South West U.S.	Florida East Coast	Northwest Florida	Southwest Florida	Total
Goodwill . . .	$37,940	$ —	$ —	$14,664	$19,144	$ —	$ —	$ —	$71,748
Trade name .	$ 5,245	$8,810	$6,755	$ 2,560	$ 3,706	$4,440	$5,728	$12,590	$49,834

The estimated fair value measurements were developed using significant unobservable inputs (Level 3). For goodwill, the primary valuation technique used was an income methodology based on management's estimates of forecasted cash flows for each reporting unit, with those cash flows discounted to present value using rates commensurate with the risks of those cash flows. In addition, management used a market-based valuation method involving analysis of market multiples of revenues and earnings before interest, taxes, depreciation and amortization ("EBITDA") for (i) a group of comparable public companies and (ii) recent transactions, if any, involving comparable companies. For trade name intangible assets, management used the income-based relief-from-royalty valuation method in which fair value is the discounted value of forecasted royalty revenues arising from a trade name using a royalty rate that an independent party would pay for use of that trade name. Assumptions used by management were similar to those that management believes would be used by market participants performing valuations of these regional divisions. Management's assumptions were based on analysis of current and expected future economic conditions and the strategic plan for each reporting unit.

In addition to the goodwill and trade name impairment losses noted above, an impairment loss of approximately $2.7 million, reported in impairment loss on the consolidated statements of comprehensive loss, was recognized during the third quarter of 2011 related to the Company's write-off of its 45% investment interest in a radio-surgery center in Rhode Island in the North East U.S. region due to continued operating losses since its inception in 2008. The estimated fair value measurements were developed using significant unobservable inputs (Level 3), including continued operating losses, declining operating cash flow and the limited use of the CyberKnife technology in treating cancer patients. In addition, during the fourth quarter of 2011, an impairment loss of approximately $0.8 million, reported in impairment loss on the consolidated statements of comprehensive loss, was recognized related to the impairment of certain leasehold improvements of a planned radiation treatment facility office closing in Baltimore, Maryland in the Central South East U.S. region and $0.7 million impairment on certain deposits on equipment.

The Company implemented the qualitative screen test approach in assessing goodwill impairment for its international region. The qualitative analysis was limited to the international region due to its recent expansion into a new divisional region as a result of the Company's acquisition of MDLLC on March 1, 2011. Factors that contributed to the qualitative screen test included the macroeconomic

(5) Goodwill and Intangible Assets (Continued)

conditions in Latin America remained strong in 2011 and its growth exceeding the growth estimates of the U.S. economy. Other factors included continued migration toward more clinically sophisticated radiation oncology services which have higher reimbursement rates, and the implementation of operational enhancements from equipment upgrades which enable the Company to increase the number of patients treated and improve the clinical quality of the service. Operational improvements, improvements in treatment mix, as well as new capacity coming on line from the Company's recent acquisition of five additional radiation treatment centers in Argentina in November 2011 are expected to produce continued growth in the international region. As the international region's current and projected results exceed original forecasts, the Company's view that it is more likely than not that the value of the international reporting unit is equal to or in excess of its carrying amount and therefore a further quantitative step 1 goodwill impairment analysis was not necessary.

2010

The Company completed its annual impairment testing for goodwill and indefinite-lived intangible assets on October 1, 2010. Based on (i) assessment of current and expected future economic conditions, (ii) trends, strategies and forecasted cash flows at each reporting unit and (iii) assumptions similar to those that market participants would make in valuing the Company's reporting units, the Company's management determined that the carrying value of goodwill in certain markets, including California, South West United States (central Arizona and Las Vegas, Nevada) and the Florida east coast regions exceeded their fair value. Accordingly, the Company recorded noncash impairment charges totaling $91.2 million in the consolidated statements of operations. Subsequent to the Company's October 1 annual goodwill impairment testing, the Company evaluated the economic performance of certain of its California offices. The Company concluded that it is unlikely these offices would remain operational beyond 2011. Pursuant to *ASC 350 Intangibles—Goodwill and Other*, the Company recorded an additional $2.5 million noncash impairment charge based on the relative fair value of these offices as compared to the fair value of the portion of the California reporting unit to be retained. Impairment charges relating to goodwill are summarized as follows:

(in thousands):	California	South West United States	Florida east coast	Total
Goodwill	$35,033	$46,377	$12,256	$93,666

(5) Goodwill and Intangible Assets (Continued)

The changes in the carrying amount of goodwill are as follows:

(in thousands):	Year ended December 31, 2011	2010	2009
Balance, beginning of period			
Goodwill	$ 864,564	$826,641	$824,579
Accumulated impairment losses	(93,666)	—	—
Goodwill, beginning of period	770,898	826,641	824,579
Goodwill acquired during the period	86,977	37,923	—
Earn-out provisions	—	—	2,250
Impairment	(298,263)	(93,666)	—
Adjustments to purchase price allocations	—	—	(188)
Foreign currency translation	(3,065)	—	—
Balance, end of period			
Goodwill	948,476	864,564	826,641
Accumulated impairment losses	*(391,929)	(93,666)	—
Net goodwill, end of period	$ 556,547	$770,898	$826,641

* Accumulated impairment losses incurred relate to the U.S. Domestic reporting segment.

(in thousands):	Year ended December 31, 2011	2010	2009
Balance, beginning of period	$ 770,898	$826,641	$824,579
Goodwill recorded during the period	86,977	37,923	—
Earn-out provisions	—	—	2,250
Impairment	(298,263)	(93,666)	—
Adjustments to purchase price allocations	—	—	(188)
Foreign current translation	(3,065)	—	—
Balance, end of period	$ 556,547	$770,898	$826,641

(5) Goodwill and Intangible Assets (Continued)

Intangible assets consist of the following:

	December 31, 2011				
(in thousands): Intangible assets subject to amortization	Gross	Impairment loss	Accumulated Amortization	Foreign Currency Translation	Net
Noncompete agreements	$ 58,257	$ —	$(40,166)	(4)	$18,087
Hospital Contracts	19,994	—	(1,017)	(984)	17,993
Trade names	62,882	(58,244)	(928)	—	3,710
Intangible assets not subject to amortization (indefinite-lived)					
Trade names	2,682	—	—	(79)	2,603
Balance, end of period	$143,815	$(58,244)	$(42,111)	(1,067)	$42,393

	December 31, 2010		
(in thousands): Intangible assets subject to amortization	Gross	Accumulated Amortization	Net
Noncompete agreements	$ 55,767	$(33,855)	$21,912
Other licenses	145	(145)	—
Intangible assets not subject to amortization (indefinite-lived)			
Trade names	63,324	—	63,324
Balance, end of period	$119,236	$(34,000)	$85,236

Amortization expense relating to intangible assets was approximately $8.1 million, $7.3 million, $14.6 million for the years ended December 31, 2011, 2010 and 2009, respectively. The weighted-average amortization period is approximately 9.6 years.

Estimated future amortization expense is as follows (in thousands):

2012	$11,034
2013	7,324
2014	3,955
2015	3,159
2016	1,551

(6) Acquisitions

In January 2009, the Company purchased from family members of a related party (i) a 33% interest in a joint venture that held a majority equity interest in and managed 26 radiation therapy treatment centers in South America, Central America and the Caribbean and (ii) a 19% interest in a joint venture, which operates a treatment center in Guatemala, for approximately $10.4 million, subject to final determination of the purchase price based on a multiple of historical earnings before interest, taxes, and depreciation and amortization. In January 2010, the Company finalized the amount due for its 33% interest in the joint venture and paid an additional $1.9 million. The transaction had been accounted for under the equity method.

During 2009, the Company acquired the assets of several urology practices in Florida for approximately $0.2 million. The urology practices provide synergistic clinical services to our patients. The allocation of the purchase price is to tangible assets of $0.2 million.

In March 2010, the Company contributed approximately $3.0 million in tangible assets for a 77.3% interest in a joint venture with a group of physicians to open a radiation treatment center in El Segundo, California. The radiation treatment center expands the Company's presence in the California market.

In April 2010, the Company entered into definitive agreements to acquire all the outstanding stock of Carolina Regional Cancer Center, P.A. for the acquisition of a radiation treatment center in Myrtle Beach, South Carolina that held three certificate of need licenses, and Atlantic Urology Clinics, LLC, Adult & Pediatric Urology Center of the Carolina, P.A., Coastal Urology Center, P.A. and Grand Strand Urology, LLP with respect to the acquisition of the assets of these Myrtle Beach-based physician practices. On May 3, 2010, the Company consummated these acquisitions for a combined purchase price of approximately $34.5 million in cash. The acquisition of the Myrtle Beach facility expands the Company's presence into a new local market within an existing regional division. The allocation of the purchase price was to tangible assets, primarily consisting of medical equipment of $4.8 million and assumed liabilities of approximately $0.3 million. The excess of the purchase price over the fair value of the assets acquired was allocated to goodwill of $30.0 million, which is deductible for tax purposes, representing primarily the value of synergies expected from the transaction.

During the year ended December 31, 2010 the Company recorded $12.4 million of net patient service revenue and reported net income of $1.9 million in connection with the Carolina Regional Cancer Center, P.A. acquisition.

In December 2010, the Company acquired the assets of a radiation treatment center located in Princeton, West Virginia for approximately $8.0 million. The center purchased in West Virginia further expands the Company's presence into the West Virginia market, which is a certificate of need state. The allocation of the purchase price is to tangible assets, primarily consisting of medical equipment of $0.2 million. The excess of the purchase price over the fair value of the assets acquired was allocated to goodwill of $7.8 million.

During 2010, the Company acquired the assets of several physician practices in Florida and Arizona for approximately $0.9 million. The physician practices provide synergistic clinical services to our patients in the respective markets in which we treat. The allocation of the purchase price was to tangible assets of $0.9 million.

(6) Acquisitions (Continued)

In 2010, the Company held a 33% interest in Medical Developers and on March 1, 2011, the Company purchased the remaining 67% interest in Medical Developers, LLC ("MDLLC") from Bernardo Dosoretz as well as interests in the subsidiaries of MDLLC from Alejandro Dosoretz and Bernardo Dosoretz, resulting in an ownership interest of approximately 91% in the underlying radiation oncology practices located in South America, Central America and the Caribbean. The Company also purchased an additional 61% interest in Clinica de Radioterapia La Asuncion S.A. from Bernardo Dosoretz, resulting in an ownership interest of 80%. The acquisition of the remaining interests expands the Company's presence into a new regional division. The Company consummated these acquisitions for a combined purchase price of approximately $82.7 million, comprised of $47.5 million in cash, 25 common units of Parent immediately exchanged for 13,660 units of RT Investments' non-voting preferred equity units and 258,955 units of RT Investments' class A equity units totaling approximately $16.25 million, and issuance of a 9⅞% note payable, due 2017 totaling approximately $16.05 million to the seller, an estimated contingent earn out payment totaling $2.3 million, and issuance of real estate located in Costa Rica totaling $0.6 million. The earn out payment is contingent upon certain acquired centers attaining earnings before interest, taxes, depreciation and amortization targets, is due 18 months subsequent to the transaction closing, and is payable through Company financing and issuance of equity units. The Company estimates the potential range of earn out payments to be, on an undiscounted basis, between $0 and $7.35 million, however the earn out payment is uncapped. The Company utilized the income and market approaches as well as the option pricing allocation methodology to value the equity units issued as consideration.

The allocation of the purchase price was as follows (in thousands):

Cash	$47,500
Seller financing note	16,047
Company's issuance of equity	16,250
Contingent earn-out	2,340
Issuance of real estate	561
Total consideration transferred	82,698
Net identifiable assets acquired	15,527
Goodwill	$67,171

(6) Acquisitions (Continued)

The following table summarizes the allocation of the aggregate purchase price of MDLLC, including assumed liabilities (in thousands):

Fair value of net assets acquired:	
Cash and cash equivalents	$ 5,396
Accounts receivable, net	18,892
Prepaid expenses	268
Deferred tax assets	1,465
Other noncurrent assets	85
Property and equipment	8,479
Intangible assets	23,600
Accounts payable	(3,121)
Accrued expenses	(2,064)
Current portion of long-term debt	(422)
Income taxes payable	(3,048)
Other current liabilities	(580)
Long-term debt, less current portion	(686)
Deferred income taxes	(6,720)
Previously held equity interest	(16,150)
Other long-term liabilities	(2,117)
Noncontrolling interests—nonredeemable	(7,750)
Net identifiable assets acquired	$ 15,527

The Company recorded the acquisition at its fair value upon gaining a controlling interest in MDLLC at March 1, 2011. The Company's previously held equity interest in the acquired entities as of the acquisition date totaled approximately $16.15 million. For purposes of valuing the previously held equity interest, the Company used the discounted cash flow method, a derivation of the income approach, which considered a number of factors such as the MDLLC's performance projections, MDLLC's cost of capital, and consideration ascribed to applicable discounts for lack of control and marketability. The Company recorded a gain on the previously held equity interest totaling approximately $0.2 million identified as gain on fair value adjustment of previously held equity investment in the accompanying condensed consolidated statements of comprehensive loss.

The Company acquired noncontrolling interests totaling approximately $7.75 million as of the acquisition date. The Company valued the noncontrolling interests using the discounted cash flow method, a derivation of the income approach, which considered a number of factors such as the MDLLC's performance projections, MDLLC's cost of capital, and consideration ascribed to applicable discounts for lack of control and marketability. The Company acquired a number of hospital contract arrangements that have varying expiration dates through February 1, 2020. The weighted-average period prior to the next renewal period is 4.1 years as of December 31, 2011.

(6) Acquisitions (Continued)

Net identifiable assets includes the following preliminary intangible assets:

Trade name (indefinite life)	$ 1,750
Non-compete agreement (5 year life)	2,000
Hospital contract arrangements (18.5 year life)	19,850
	$23,600

The Company valued the trade name using the relief from royalty method, a derivation of the income approach that estimates the benefit of owning the trade name rather than paying royalties for the right to use a comparable asset. The Company considered a number of factors to value the trade name, including MDLLC's performance projections, royalty rates, discount rates, strength of competition, and income tax rates.

The Company valued the non-compete agreement using the discounted cash flow method, a derivation of the income approach that evaluates the difference in the sum of MDLLC's present value of cash flows of two scenarios: (1) with the non-compete in place and (2) without the non-compete in place. The Company considered various factors in determining the non-compete value including MDLLC's performance projections, probability of competition, income tax rates, and discount rates.

The Company valued the hospital contract arrangements using the excess earnings method, which is a form of the income approach. This method includes projecting MDLLC's revenues and expenses attributable to the existing hospital contract arrangements, and then subtracts the required return on MDLLC's net tangible assets and any intangible assets used in the business in order to determine any residual excess earnings attributable to the hospital contract arrangements. The after tax excess earnings are then discounted to present value using an appropriate risk adjusted rate of return.

The weighted-average amortization period for the acquired amortizable intangible assets as of December 31, 2011 is approximately 18.1 years. Total amortization expense recognized for the acquired amortizable intangible assets totaled approximately $1.2 million for the year ended December 31, 2011.

Estimated future amortization expense for the acquired amortizable intangible assets is as follows (in thousands):

2012	$1,473
2013	1,473
2014	1,473
2015	1,473
2016	1,140
2017	1,073

The excess of the purchase price over the fair value of the net assets acquired was allocated to goodwill of $67.9 million, representing primarily the value of estimated cost savings and synergies expected from the transaction. The goodwill is not deductible for tax purposes and is included in the Company's international geographic segment.

(6) Acquisitions (Continued)

During the year ended December 31, 2011, the Company recorded $59.0 million of net patient service revenue and reported net income of $2.2 million in connection with the MDLLC and Clinica de Radioterapia Cancer Center, P.A. acquisitions.

The following pro forma financial information is presented as if the purchase of the additional interests in MDLLC and Clinica de Radioterapia La Asuncion S.A. had occurred as of January 1, 2010. The pro forma financial information is not necessarily indicative of what the Company's results of operations actually would have been had the Company completed the acquisition at the dates indicated. In addition, the unaudited pro forma financial information does not purport to project the future operating results of the combined company:

	Years ended December 31,	
(in thousands):	2011	2010
Pro forma total revenues	$ 654,898	$ 599,058
Pro forma net loss attributable to Radiation Therapy Services Holdings, Inc. shareholder	(352,588)	(110,854)

As of December 31, 2011, Medical Developers LLC had approximately 590 employees, 298 of whom are covered by a collective bargaining agreement with the Health Care Providers union corresponding to the agreement N° 108/75. The agreement does not have a fixed term, although payment increase is negotiated every year by the labor union.

Cash at December 31, 2011 held by the Company's foreign subsidiaries was $5.2 million. The Company considers these cash amounts to be permanently invested in the Company's foreign subsidiaries and therefore does not anticipate repatriating any excess cash flows to the U.S. The Company anticipates it can adequately fund its domestic operations from cash flows generated solely from the U.S. business. Of the $5.2 million of cash held by the Company's foreign subsidiaries at December 31, 2011, $0.4 million is held in U.S. Dollars, $0.1 million of which is held at banks in the United States, with the remaining held in foreign currencies in foreign banks. The Company believes that the magnitude of its growth opportunities outside of the U.S. will cause the Company to continuously reinvest foreign earnings. The Company does not require access to the earnings and cash flow of its international subsidiaries to fund its U.S. operations.

On August 29, 2011, the Company acquired the assets of a radiation treatment center and other physician practices located in Redding, California, for approximately $9.6 million. The acquisition of the Redding facility further expands the Company's presence into the Northern California market. The allocation of the purchase price is to tangible assets of $3.3 million, intangible assets including $0.3 million trade name and non-compete agreements of $0.3 million, amortized over 5 years, and goodwill of $5.7 million, which is deductible for tax purposes.

In September 2011, the Company entered into a professional services agreement with a hospital district in Broward County, Florida to provide professional services at two radiation oncology sites within the hospital district.

On November 4, 2011, the Company purchased an 80% interest in an operating entity, which operates 1 radiation treatment center in Argentina; an 80% interest in another operating entity, which

(6) Acquisitions (Continued)

operates 3 radiation treatment centers in Argentina; and a 96% interest in an operating entity, which operates 1 radiation treatment center in Argentina. The combined purchase price of the ownership interests totals approximately $7.4 million, comprised of $2.1 million in cash, seller financing totaling approximately $4.0 million payable over 24 monthly installments, commencing January 2012, and a purchase option totaling approximately $1.3 million. The acquisition of these operating treatment centers expands the Company's presence in its international markets. The allocation of the purchase price is to tangible assets of $3.7 million (including cash of $0.6 million), intangible assets including $0.2 million trade name and non-compete agreements of $0.2 million, amortized over 5 years, goodwill of $8.1 million, which is deductible for U.S. tax purposes but non-deductible for foreign tax purposes, liabilities of $3.4 million, and noncontrolling interests redeemable of $1.4 million.

On December 22, 2011, the Company acquired the interest in an operating entity which operates two radiation treatment centers located in North Carolina, for approximately $6.3 million. The acquisition of the two radiation treatment centers further expands the Company's presence into the eastern North Carolina market. The allocation of the purchase price is to tangible assets of $0.8 million, goodwill of $6.0 million, which is deductible for tax purposes, other current liabilities of approximately $0.1 million and an earn-out provision of approximately $0.4 million contingent upon maintaining a certain level of patient volume.

During 2011, the Company acquired the assets of several physician practices in Florida and the non-professional practice assets of several North Carolina physician practices for approximately $0.4 million. The physician practices provide synergistic clinical services to our patients in the respective markets in which we treat. The allocation of the purchase price is to tangible assets of $0.4 million.

The operations of the foregoing acquisitions have been included in the accompanying consolidated statements of operations and comprehensive loss from the respective dates of each acquisition.

Allocation of Purchase Price

The purchase prices of these transactions were allocated to the assets acquired and liabilities assumed based upon their respective fair values. The purchase price allocations for certain recent transactions are subject to revision as the Company obtains additional information. The operations of the foregoing acquisitions have been included in the accompanying consolidated statements of

(6) Acquisitions (Continued)

comprehensive loss from the respective dates of acquisition. The following table summarizes the allocations of the aggregate purchase price of the acquisitions, including assumed liabilities.

	Years Ended December 31,		
(in thousands):	2011	2010	2009
Fair value of net assets acquired, excluding cash:			
Accounts receivable, net	$ 20,306	$ —	$ —
Inventories	39	65	—
Other current assets	423	614	—
Deferred tax assets	1,925	—	—
Other noncurrent assets	159	18	—
Property and equipment	13,980	5,086	199
Intangible assets	24,580	—	—
Goodwill	86,977	37,923	2,250
Current liabilities	(11,356)	(318)	—
Long-term debt	(686)	—	—
Deferred tax liabilities	(6,720)	—	—
Other noncurrent liabilities	(6,250)	—	—
Previously held equity investment	(16,150)	—	—
Noncontrolling interest	(9,114)	—	—
	$ 98,113	$43,388	$2,449

(7) Other Income and Loss

Impairment Loss

During 2009, the Company recorded an impairment loss of approximately $3.5 million primarily relating to an impairment loss incurred of approximately $1.8 million for the write down to fair value of certain of the Company's liner accelerators and CT machines due to technological obsolescence. The adjustment to machine inventories was due to several considerations, including the planned use of RapidArc technology on 3-D digital machines for which this technology cannot be implemented on 2-D digital machines or analog machines. RapidArc radiotherapy technology is an effective cancer treatment representing an advanced new form of image-guided IMRT. This technology enables clinicians to program a linear accelerator to deliver precise forms of IMRT up to eight times faster than other IMRT systems. It does this by delivering the complete IMRT treatment to the patient in fewer rotations than traditional IMRT.

Impairment loss of approximately $97.9 million was recognized in 2010 related to our write-off of our investment in a 50% interest in an international freestanding radiation center in Mohali, India of approximately $0.7 million, certain planned office closings in California and Michigan of approximately $3.5 million and goodwill impairment in certain of our reporting units, including California, Southwest U.S. (Arizona and Nevada) and the Florida east coast of approximately $93.7 million.

During the third quarter of 2011, the Company completed an interim impairment test for goodwill and indefinite-lived intangible assets as a result of its review of growth expectations and the release of

(7) Other Income and Loss (Continued)

the final rule issued on the physician fee schedule for 2012 by CMS on November 1, 2011, which included certain rate reductions on Medicare payments to freestanding radiation oncology providers. In performing this test, the Company assessed the implied fair value of its goodwill and intangible assets. As a result, the Company incurred an impairment loss of approximately $237.6 million in 2011 primarily relating to goodwill and trade name impairment in certain of its reporting units, including North East United States (New York, Rhode Island, Massachusetts and southeast Michigan), California, Southwest U.S. (Arizona and Nevada) , the Florida east coast, Northwest Florida and Southwest Florida. This impairment loss was comprised of approximately $234.9 million relating to goodwill and intangible assets and an impairment loss incurred of approximately $2.7 million in 2011 related to our write-off of our 45% investment interest in a radio-surgery center in Rhode Island due to continued operating losses since its inception in 2008.

During the fourth quarter of 2011, the Company decided to rebrand its current trade name of 21st Century Oncology. As a result of the rebranding initiative and concurrent with the Company's annual impairment test for goodwill and indefinite-lived intangible assets, the Company incurred an impairment loss of approximately $121.6 million. Approximately $49.8 million of the $121.6 million related to the trade name impairment as a result of the rebranding initiative. The remaining $71.8 million of impairment relating to goodwill in certain of the Company's reporting units, including North East United States, (New York, Rhode Island, Massachusetts and southeast Michigan), and California, Southwest U.S. (Arizona and Nevada). The remaining domestic U.S. trade name of approximately $4.6 million will be amortized over its remaining useful life through December 31, 2012. The Company incurred approximately $0.9 million in amortization expense during the fourth quarter. In addition, during the fourth quarter of 2011, an impairment loss of approximately $0.8 million, reported in impairment loss on the consolidated statements of comprehensive loss, was recognized related to the impairment of certain leasehold improvements of a planned radiation treatment facility office closing in Baltimore, Maryland and $0.7 million impairment on certain deposits on equipment. The Company plans to complete the treatment of its current patients undergoing radiation treatment and close the radiation facility during the first quarter of 2012.

Loss on investments

During the fourth quarter of 2011, the Company incurred a loss on a 50% investment in an unconsolidated joint venture in a freestanding radiation facility in West Palm Beach Florida. The Company plans on withdrawing from the joint venture during the first quarter of 2012. The Company incurred a loss on the investment of approximately $0.5 million.

During the fourth quarter of 2011, the Company sold a 2% investment interest in a primary care physician practice for approximately $1.0 million. The Company recorded a gain on the sale of the investment of approximately $0.3 million.

Gain on fair value adjustment of previously held equity investment.

As result of the acquisition of MDLLC, in which the Company acquired an effective ownership interest of approximately 91.0% on March 1, 2011, the Company recorded a gain of approximately $0.2 million to adjust its initial investment in the joint venture to fair value.

(7) Other Income and Loss (Continued)

Early Extinguishment of Debt

On April 20, 2010, the Company issued $310.0 million in aggregate principal amount of 9⅞% senior subordinated notes due 2017 and repaid the existing $175.0 million in aggregate principal amount 13.5% senior subordinated notes due 2015, including accrued and unpaid interest and a call premium of approximately $5.3 million. The Company incurred approximately $10.9 million in early extinguishment of debt as a result of the prepayment of the $175.0 million in senior subordinated notes, which included a call premium payment of approximately $5.3 million, the write-offs of $2.5 million in deferred financing costs and $3.1 million in original issue discount costs.

(8) Income Taxes

Significant components of the income tax provision are as follows:

	Years Ended December 31,		
(in thousands):	2011	2010	2009
Current provision:			
Federal	$ (1,166)	$ 2,414	$ 1,791
State	(347)	4,474	598
Foreign	5,026	—	—
Deferred (benefit) provision:			
Federal	(25,726)	(19,845)	(2,876)
State	(3,064)	147	1,489
Foreign	(88)	—	—
Total income tax provision (benefit)	$(25,365)	$(12,810)	$ 1,002

(8) Income Taxes (Continued)

A reconciliation of the statutory federal income tax rate to the Company's effective income tax rate on income before income taxes are as follows:

	Years Ended December 31,		
	2011	2010	2009
Federal statutory rate	35.0%	35.0%	35.0%
State income taxes, net of federal income tax benefit	1.3	1.4	25.2
Effects of rates different than statutory	0.1	—	—
Nondeductible charge for stock-based compensation	(0.1)	(0.3)	(5.0)
Nondeductible charge for lobbying and political donations	(0.1)	(0.3)	(4.1)
Goodwill impairment	(21.3)	(13.8)	—
Tax rate changes on existing temporary differences	0.1	(0.4)	13.3
Income from noncontrolling interests	0.2	0.6	10.3
Valuation allowance increase	(7.7)	(11.2)	(51.0)
Purchase accounting adjustments	—	—	(16.5)
Federal and state true-ups	—	(1.0)	(17.7)
Uncertain tax positions current year	(0.3)	(1.1)	(1.3)
Prior period adjustments for uncertain tax positions and deferred tax true-ups	0.1	1.6	—
Other permanent items	(0.5)	(0.4)	(3.1)
Total income tax provision	6.8%	10.1%	(14.9)%

The Company provides for income taxes using the liability method in accordance with ASC 740, *Income Taxes*. Deferred income taxes arise from the temporary differences in the recognition of income

(8) Income Taxes (Continued)

and expenses for tax purposes. Deferred tax assets and liabilities are comprised of the following at December 31, 2011 and 2010:

(in thousands):	December 31, 2011	December 31, 2010
Deferred income tax assets:		
Provision for doubtful accounts	$ 7,438	$ 4,848
State net operating loss carryforwards	8,096	6,336
Federal net operating loss carryforwards	28,382	22,525
Deferred rent liability	2,588	2,034
Intangible assets—U.S.	15,683	—
Management fee receivable allowance	8,466	9,945
Merger costs and debt financing costs	4,985	2,724
Unrealized loss on swap	1,027	2,058
Other	7,342	7,064
Gross deferred income tax assets	84,007	57,534
Valuation allowance	(45,458)	(17,641)
Net deferred income tax assets	38,549	39,893
Deferred income tax liabilities:		
Property and equipment	(37,508)	(36,128)
Intangible assets—U.S.	—	(29,514)
Intangible assets—Foreign	(6,253)	—
Prepaid expense	(885)	(1,217)
Partnership interests	(843)	(2,970)
Other	(434)	(1,315)
Total deferred tax liabilities	(45,923)	(71,144)
Net deferred income tax liabilities	$ (7,374)	$(31,251)

ASC 740, *Income Taxes*, requires that a valuation allowance be established when it is more likely than not that all or a portion of a deferred tax asset will not be realized. In 2009, the Company determined that a valuation allowance of $3.4 million was appropriate under the provisions of ASC 740. This valuation allowance of $3.4 million was against state deferred tax assets. Primarily because of the taxable loss for the year ended December 31, 2010, the Company determined that the valuation allowance should be $17.6 million, consisting of $12.3 million against federal deferred tax assets and $5.3 million against state deferred tax assets. This represents an increase of $14.2 million in valuation allowance.

For the year ended December 31, 2011, the Company determined that the valuation allowance was approximately $45.5 million, consisting of $38.3 million against federal deferred tax assets and

(8) Income Taxes (Continued)

$7.2 million against state deferred tax assets. The valuation allowance increased approximately $27.9 million from $17.6 million in 2010 to $45.5 million in 2011.

Description:	Beginning Balance	Tax Expense	Other Comprehensive Income	Ending Balance
Fiscal Year 2009	—	(3.4)		(3.4)
Fiscal Year 2010	(3.4)	(14.2)		(17.6)
Fiscal Year 2011	(17.6)	(28.8)	0.9	(45.5)

During the year ended December 31, 2010, the Company undertook an analysis of its cumulative position with respect to income taxes on the balance sheet and identified certain balance adjustments required to be recorded. Those adjustments resulted in a current year tax benefit in the amount of $2.0 million, which is the difference between the tax benefit resulting from an $8.7 million adjustment to deferred tax assets and the tax expense resulting from an additional 4.0 million to tax contingency.

The Company has federal net operating loss carryforwards beginning to expire in 2028 available to offset future taxable income of approximately $81.0 million and $64.4 million at December 31, 2011 and 2010, respectively.

At December 31, 2011 and 2010 the Company has state net operating loss carryforwards, primarily in Florida and Kentucky beginning to expire in years 2013 through 2028, available to offset future taxable income of approximately $201.8 million, and $157.9 million, respectively. Utilization of net operating loss carryforwards in any one year may be limited.

ASC 740, *Income Taxes*, clarifies the accounting for uncertainty in income taxes recognized in an entity's financial statements and prescribes a threshold for the recognition and measurement of tax position taken or expected to be taken on a tax return. Under ASC 740, *Income Taxes*, the impact of an uncertain tax position on the income tax return must be recognized at the largest amount that is more-likely-than-not to be sustained upon audit by the relevant taxing authority. An uncertain income tax position will not be recognized if it has less than a 50% likelihood of being sustained. Additionally, ASC 740, *Income Taxes*, provides guidance on derecognition, classification, interest and penalties, accounting in interim periods, disclosure, and transition.

Since its adoption for uncertainty in income taxes pursuant to ASC 740, *Income Taxes*, the Company has recognized interest and penalties accrued related to unrecognized tax exposures in income tax expense. During the year ended December 31, 2011, the Company released approximately $0.9 million in interest and penalties related to unrecognized tax exposures in income tax expense. During the year ended December 31, 2010, the Company accrued approximately $2.1 million in interest and penalties related to unrecognized tax exposures in income tax expense. The Company had accrued $25,000 as of December 31, 2009. The Company did not make any payments of interest and penalties accrued during the years ended December 31, 2011, and 2010.

(8) Income Taxes (Continued)

A reconciliation of the beginning and ending balances of the total amounts of gross unrecognized tax benefits is a follows (in thousands):

Gross unrecognized tax benefits at January 1, 2009	$ 260
Increase in tax positions for prior years	59
Increase in tax positions for current year	78
Gross unrecognized tax benefits at December 31, 2009	$ 397
Gross unrecognized tax benefits at January 1, 2010	$ 397
Increase in tax positions for prior years	4,864
Increase in tax positions for current year	706
Gross unrecognized tax benefits at December 31, 2010	$ 5,967
Gross unrecognized tax benefits at January 1, 2011	$ 5,967
Decrease in tax positions for prior years	(1,971)
Decrease related to settlements with the taxing authorities	(1,988)
Decrease related to the lapse of the statute of limitations	(320)
Increase in tax positions for current year	49
Gross unrecognized tax benefits at December 31, 2011	$ 1,737

The total amount of gross unrecognized tax benefits that, if recognized, would affect that effective tax rate was $0.9 million, $1.7 million at December 31, 2011 and 2010, respectively. The Company expects that unrecognized tax benefits in the amount of $0.1 million will reverse within the next 12 months due to resolution of ongoing federal income tax audits. Moreover, the Company expects that unrecognized tax benefits in the amount of $0.8 million will reverse within the next 12 months due to resolution of ongoing state income tax audits.

The Company is subject to taxation in the U.S., approximately 22 state jurisdictions and countries throughout Latin America, namely, Argentina, Bolivia, Costa Rica, Dominican Republic, El Salvador, Guatemala and Mexico. However, the principal jurisdictions in which the Company is subject to tax are the U.S., Florida and Argentina.

The Company's future effective tax rates could be affected by changes in the relative mix of taxable income and taxable loss jurisdictions, changes in the valuation of deferred tax assets or liabilities, or changes in tax laws or interpretations thereof. The Company monitors the assumptions used in estimating the annual effective tax rate and makes adjustments, if required, throughout the year. If actual results differ from the assumptions used in estimating the Company's annual effective tax rates, future income tax expense (benefit) could be materially affected.

The Company has not provided U.S. federal and state deferred taxes on the cumulative earnings of non-US affiliates and associated companies that have been reinvested indefinitely offshore. With respect to the portion of unremitted earnings of certain lower-tier non-US affiliates and associated companies where the Company is not applying the indefinite reinvestment exception, no deferred tax liability has been provided due to dividend exemption rules at the local foreign holding company level and future tax planning strategies at the U.S. level. The aggregate undistributed earnings of the

(8) Income Taxes (Continued)

Company's foreign operating subsidiaries for which no deferred tax liability has been recorded is approximately $3.3 million. It is not practicable to determine the U.S income tax liability that would be payable if such earnings were not reinvested indefinitely.

The Company is routinely under audit by federal, state, or local authorities in the areas of income taxes and other taxes. These audits may include questioning the timing and amount of deductions and compliance with federal, state, and local tax laws. The Company regularly assesses the likelihood of adverse outcomes from these audits to determine the adequacy of the Company's provision for income taxes. To the extent the Company prevails in matters for which accruals have been established or is required to pay amounts in excess of such accruals, the effective tax rate could be materially affected. In accordance with the statute of limitations for federal tax returns, the Company's federal tax returns for the years 2007 through 2010 are subject to examination. The Company is currently undergoing a Federal income tax audit for tax years 2007 through 2008 and New York State audit for tax years 2006 through 2008. Subsequent to the end of the year, the Company closed the Federal audit for tax years 2005 and 2006, the Alabama audit for tax years 2009 and 2010 and Florida audit for tax years 2007 through 2009.

(9) Long-Term Debt

The Senior Credit Facility consists of a $347.0 million six-year senior secured term loan facility, a $90.1 million six-year senior secured revolving credit facility, and a $34.9 million five-year secured revolving credit facility. Senior Subordinated notes due April 15, 2017 were issued in April 2010 of approximately $310.0 million. In March 2011, the Company issued an additional $50.0 million in Senior Subordinated notes due April 15, 2017 of which the proceeds were used to fund the MDLLC transaction and an additional $16.25 million issued to the seller in the transaction.

The Company's long-term debt consists of the following (in thousands):

	December 31, 2011	December 31, 2010
$347.0 million senior secured credit facility—(Term Loan B portion) (net of unamortized debt discount of $993 and $1,450 at December 31, 2011 and 2010, respectively) with interest rates at LIBOR or prime plus applicable margin, collateralized by substantially all of the Company's assets. At December 31, 2011 and 2010, interest rates were at LIBOR plus applicable margin, at 5.0% and 4.5%, respectively, due at various maturity dates through February 2014	$264,367	$263,910
$90.1 million senior secured credit facility (extended revolving credit portion) with interest rates at LIBOR or prime plus applicable margin, collateralized by substantially all of the Company's assets. At December 31, 2011, interest rates were at LIBOR plus applicable margin, at 5.0% due at various maturity dates through February 2014	7,212	—

(9) Long-Term Debt (Continued)

	December 31, 2011	December 31, 2010
$34.9 million senior secured credit facility (non-extended revolving credit portion) with interest rates at LIBOR or prime plus applicable margin, collateralized by substantially all of the Company's assets. At December 31, 2011 and 2010, interest rates were at LIBOR plus applicable margin, at 4.5% due at various maturity dates through February 2013	2,788	8,500
$360.0 million Senior Subordinated Notes (net of unamortized debt discount of $2,027 and $1,765 at December 31, 2011 and 2010, respectively) due April 15, 2017; semi-annual cash interest payments due on April 15 and October 15, fixed interest rate of 9⅞%	357,973	308,235
$16.25 million Senior Subordinated Notes (net of unamortized debt discount of $175 at December 31, 2011) due April 15, 2017; semi-annual cash interest payments due on April 15 and October 15, fixed interest rate of 9⅞%	16,075	—
$2.9 million various other notes payable with average interest rate of 21.5% due through August 2019	2,933	—
$4.0 million in seller financing promissory notes with average interest rate of 6.21% due through December 2013	4,005	—
Capital leases payable with various monthly payments plus interest at rates ranging from 4.5% to 9.1%, due at various maturity dates through October 2016	23,680	18,186
	679,033	598,831
Less current portion	(13,945)	(8,780)
	$665,088	$590,051

Maturities under the obligations described above are as follows at December 31, 2011 (in thousands):

2012	13,945
2013	10,835
2014	275,885
2015	3,489
2016	1,717
Thereafter	376,357
	682,228
Less unamortized debt discount	(3,195)
	$679,033

(9) Long-Term Debt (Continued)

At December 31, 2011 and 2010, the prime interest rate was 3.25%.

The Term Loan B initially bears interest either at LIBOR plus a spread of 475 basis points or a specified base rate plus a spread of 375 basis points and matures on February 21, 2014.

The non-extended revolving credit portion of the senior secured credit facility ("Non-extended Revolver") will mature on February 21, 2013. The Non-extended Revolver bears interest either at LIBOR plus a spread ranging from 350 to 425 basis points or a specified base rate plus a spread ranging from 250 to 325 basis points, with the exact spread determined upon the basis of the Company's leverage ratio, as defined. The extended revolving credit portion of the senior secured credit facility ("Extended Revolver") will mature on February 21, 2014. The Extended Revolver bears interest either at LIBOR plus a spread ranging from 400 to 475 basis points or a specified base rate plus a spread ranging from 300 to 375 basis points, with the exact spread determined upon the basis of the Company's leverage ratio, as defined. The Company is required to pay a quarterly unused commitment fee at a rate ranging from 37.5 to 50.0 basis points on the Revolver determined upon the basis of its leverage ratio, as defined.

The senior secured credit facility is secured by a pledge of substantially all of the Company's tangible and intangible assets and includes a number of restrictive covenants including limitations on leverage, capital and acquisitions expenditures and a requirement to maintain a minimum ratio of cash flow to interest. Under the terms of the Company's senior secured credit facility, borrowings under the Non-extended and Extended Revolvers are based on minimum incremental amounts of not less than $0.5 million for base rate loans and not less than $1.0 million for LIBOR rate loans.

The senior secured credit facility requires the Company to make mandatory prepayments of outstanding borrowings under certain circumstances. Mandatory prepayments include prepayments of the Term Loan B from proceeds from asset dispositions if not reinvested within a certain period of time and debt and equity issuances, limited to a percentage of the proceeds and/or an excess amount above a dollar threshold. The Company is required to prepay the Term Loan B based on certain excess cash flow requirements ranging from 25% to 50% based on the Company's leverage ratio. To date the Company has not been required to make such prepayments. The senior secured credit facility also requires the Company to comply with various other covenants, including, but not limited to, restrictions on new indebtedness, the ability to merge or consolidate, asset sales, and dividends. At December 31, 2011, the Company is in compliance with all covenants.

On March 25, 2008, the Company issued $175.0 million senior subordinated notes due 2015 at 13.5% interest rate and repaid the $175.0 million senior subordinated interim loan agreement including any accrued and unpaid interest. The senior subordinated notes required semi-annual payments of interest only. The senior subordinated notes had similar or less restrictive covenants and were junior to the senior secured credit facility for order of priority of debt repayment.

On April 1, 2010, the Company amended its senior secured credit facility, to among other things, (i) under certain circumstances, allow the Company to issue permitted additional subordinated debt to fund certain future acquisitions; (ii) disregard, for purposes of calculating compliance with the financial covenants, certain provisions of "Generally Accepted Accounting Principles" (GAAP) that would require the Company to treat leased properties as owned by the Company; and (iii) provide for certain other modifications as set forth therein to permit the incurrence of additional indebtedness in

(9) Long-Term Debt (Continued)

connection with certain future acquisitions and the ability to make additional investments, subject to pro forma compliance with certain performance based incurrence covenants, and other restrictions.

On April 20, 2010, the Company issued $310.0 million in aggregate principal amount of 9⅞% senior subordinated notes due 2017 (the "Offering") and repaid the existing $175.0 million in aggregate principal amount 13.5% senior subordinated notes due 2015, including accrued and unpaid interest and a call premium of approximately $5.3 million. The remaining proceeds from the Offering were used to pay down $74.8 million of the Term Loan B and $10.0 million of the Revolver. A portion of the proceeds of the Offering was placed in a restricted account pending application to finance certain acquisitions, including the acquisitions of a radiation treatment center and physician practices in South Carolina consummated on May 3, 2010. The Company incurred approximately $11.9 million in transaction fees and expenses, including legal, accounting and other fees and expenses associated with the offering, and the initial purchasers' discount of $1.9 million.

The Company recorded approximately $10.9 million of expenses in early extinguishment of debt as a result of the prepayment of the $175.0 million in senior subordinated notes, which included a call premium payment of approximately $5.3 million, the write-offs of $2.5 million in deferred financing costs and $3.1 million in original issue discount costs.

On April 22, 2010, affiliates of certain initial purchasers of the $310.0 million in aggregate principal amount 9⅞% senior subordinated notes due 2017 provided an additional $15.0 million of commitments to the Revolver, and increased the available commitment from $60.0 million to $75.0 million. The Company paid $2.0 million to Vestar Capital Partners V, L.P. for additional transaction advisory services in respect to the incremental amendments to the existing senior secured credit facility, the additional $15.0 million of commitments to the revolver portion, and the complete refinancing of the senior subordinated notes.

On May 3, 2010, the Company further amended the senior secured credit facilities with respect to certain administrative matters, including permitting the Company to provide to the lenders thereunder, on a prospective basis, the consolidated financial statements of the parent company, Radiation Therapy Services Holdings, Inc., in lieu of those of the borrower, our wholly-owned subsidiary, Radiation Therapy Services, Inc. ("RTS").

In January 2011, the Company received a commitment letter (the "Commitment Letter") from DDJ Capital Management, LLC to purchase an aggregate principal amount of $50 million of 9⅞% Senior Subordinated Notes due 2017 ("New Notes") to be issued by RTS. On March 1, 2011, the Company issued $50 million of the New Notes. The proceeds of $48.5 million were used (i) to fund the Company's acquisition of all of the outstanding membership units of MDLLC and substantially all of the interests of MDLLC's affiliated companies (the "MDLLC Acquisition"), not currently controlled by the Company and (ii) to fund transaction costs associated with the MDLLC Acquisition.

The Company's senior secured credit facilities:

- is secured by a pledge of substantially all of the Company's tangible and intangible assets, including accounts receivable, inventory and capital stock of its existing and future subsidiaries, and requires that borrowings and other amounts due under it will be guaranteed by its existing and future subsidiaries;

(9) Long-Term Debt (Continued)

- requires the Company to make mandatory prepayments of outstanding borrowings, with a corresponding reduction in the maximum amount of borrowings available under the senior secured credit facility, with net proceeds from insurance recoveries and asset sales, and with the net proceeds from the issuance of equity or debt securities, subject to specified exceptions;
- includes a number of restrictive covenants including, among other things, limitations on leverage, capital and acquisitions expenditures, and requirements that the Company maintain minimum ratios of cash flow to interest;
- limits the Company's ability to pay dividends on its capital stock; and
- contains customary events of default, including an event of default upon a change in control.

On September 29, 2011, the Company amended its senior secured credit facility. Under the terms of the amendment, the definition of Applicable Margin was modified to increase the rate on both the senior secured term loan and extended revolving loans under the revolving credit facility provided for under the senior secured credit facility by 50 basis points. Both the senior secured term loan and amounts borrowed under the revolving credit facility will now bear interest based (i) with respect to extended revolving loans and the senior secured term loans, on either (A) LIBOR plus a spread of 475 basis points, or (B) the ABR plus a spread of 375 basis points, and (ii) with respect to non-extended revolving loans, on either (A) LIBOR plus a spread of 425 basis points, or (B) the ABR plus a spread of 325 basis points, in each case depending on whether the Company elects Eurodollar loans or ABR loans, respectively. The amendment also extended the revolving credit facility maturity by one year solely for the extended revolving loans, such that they will mature on February 21, 2014, whereas the non-extended revolving loans will continue to mature on February 21, 2013.

The amendment modified the financial covenant levels, including to modify (x) the total leverage ratio to 6.00 to 1.00 for the Company's fiscal quarters ending September 30, 2011 and December 31, 2011, decreasing thereafter as specified therein, and (y) the consolidated interest coverage ratio to 2.00 to 1.00 for the Company's fiscal quarters ending March 31, 2011 through June 30, 2012 and increasing thereafter as specified therein.

The senior secured credit facility requires that the Company comply with certain financial covenants, including:

	Requirement	Level at December 31, 2011
Maximum permitted consolidated leverage ratio	<6.00 to 1.00	5.27 to 1.00
Minimum permitted consolidated interest coverage ratio	>2.00 to 1.00	2.29 to 1.00

The maximum permitted consolidated leverage ratio required is <6.00 to 1.00 from July 1, 2011 through December 31, 2011, <5.75 to 1.00 from January 1, 2012 to June 30, 2012, <5.50 to 1.00 from July 1, 2012 to June 30, 2013 and <5.25 to 1.00 thereafter.

(9) Long-Term Debt (Continued)

The minimum permitted consolidated interest coverage ratio required is >2.00 to 1.00 through June 30, 2012, >2.05 to 1.00 from July 1, 2012 through December 31, 2012, >2.10 to 1.00 from January 1, 2013 to June 30, 2013 and >2.20 to 1.00 thereafter.

The amendment also made several modifications to the permitted investments baskets, the permitted indebtedness baskets and several definitions in the senior secured credit facility.

On September 30, 2011, the Company entered into an incremental amendment (the "Incremental Amendment") with Wells Fargo Bank, National Association, in its capacity as administrative agent for the lenders and SunTrust Bank, as incremental lender. The Incremental Amendment amends the senior secured credit facility. Under the terms of the Incremental Amendment, SunTrust Bank agreed to lend an aggregate amount up to $50 million to the Company, which will be used for general corporate purposes.

The senior secured credit facility also requires that the Company comply with various other covenants, including, but not limited to, restrictions on new indebtedness, asset sales, capital expenditures, acquisitions and dividends, with which the Company was in compliance as of December 31, 2011.

In August 2011, the Company entered into a lease line of credit with a financial institution for the purpose of obtaining financing for medical equipment purchases in the commitment amount of $12.5 million. The commitment, subject to various restrictions, is scheduled to be available through November 2011. As of December 31, 2011 the Company had utilized approximately $8.7 million under the lease line of credit.

For the year ended December 31, 2011, the Company incurred deferred financing costs of approximately $4.8 million of which $1.6 million related to the issuance of the $50.0 million in aggregate principal amount of 9⅞% senior subordinated notes due 2017 in March 2011, $2.9 million related to the amendment to the Company's senior secured credit facility and the $50.0 million incremental amendment in September 2011, and $0.3 million related to the registration of the issuance of the $16.25 million in aggregate principal amount of 9⅞% senior subordinated notes due 2017 in March 2011 related to the MDLLC transaction. For the year ended December 31, 2010, the Company incurred deferred financing costs of approximately $11.9 million for the issuance of $310.0 million in aggregate principal amount of 9⅞% senior subordinated notes due 2017. The consolidated balance sheets as of December 31, 2011 and 2010, include $17.2 million and $17.0 million, respectively, in other long-term assets related to unamortized deferred financing costs. The Company recorded approximately $4.5 million, $3.3 million, and $2.9 million, to interest expense for the years ended December 31, 2011, 2010 and 2009, respectively, related to the amortization of deferred financing costs.

(10) Real Estate Subject to Finance Obligation

The Company leases certain of its treatment centers (facility) and other properties from partnerships which are majority-owned by related parties (related-party lessor). The related-party lessor constructs the facilities in accordance with the Company's plans and specifications and subsequently leases the facility to the Company. Due to the related-party relationship, the Company is considered the owner of the facility during the construction period pursuant to the provisions of ASC 840-40, *Sale-Leaseback Transactions*. In accordance with ASC 840-40, the Company records a construction-in-progress asset for the facility with a

(10) Real Estate Subject to Finance Obligation (Continued)

corresponding finance obligation during the construction period. Certain related parties guarantee the debt of the related-party lessor, which is considered to be continuing involvement pursuant to ASC 840-40. Accordingly, these leases do not qualify as a normal sale-leaseback at the time that construction is complete and the facility is leased to the Company. As a result, the costs to construct the facilities and the related finance obligation remain on the Company's consolidated balance sheets when construction is completed. The construction costs are included in real estate subject to finance obligation in the accompanying consolidated balance sheets. The finance obligation is amortized over the lease during the construction period term based on the payments designated in the lease agreements with a portion of the payment representing a free ground lease recorded in rent expense. The assets classified as real estate subject to finance obligation are amortized on a straight-line basis over their useful lives.

In some cases, the related-party lessor will purchase a facility during the Company's acquisition of a business and lease the facility to the Company. These transactions also are within the scope of ASC 840-40. Certain related parties guarantee the debt of the related-party lessor, which is considered to be continuing involvement pursuant to ASC 840-40. Accordingly, these leases do not qualify as normal sale-leaseback. As a result, the cost of the facility, including land and the related finance obligation are recorded on the Company's consolidated balance sheets. The cost of the facility, including land, is included in real estate subject to finance obligation in the accompanying consolidated balance sheets. The finance obligation is amortized over the lease term based on the payments designated in the lease agreements and the Real Estate Subject to Finance Obligation are amortized on a straight-line basis over their useful lives.

As of March 31, 2010, the related party lessors completed the refinancing of certain of their respective mortgages to remove the personal guarantees of the debt related thereto. As a result, of the refinancing of the landlords' mortgages on these respective properties the Company derecognized approximately $64.8 million in real estate subject to finance obligation, $67.7 million in finance obligation and recorded approximately $2.9 million of deferred gains that will be amortized as a reduction of rent expense over 15 years. In addition, the Company entered into a new master lease arrangement with the related party lessors on 28 properties. The initial term of the master lease is 15 years with four 5 year renewal options. Annual payments, including executory costs, total approximately $13.4 million pursuant to the master lease. The lease payments are scheduled to increase annually based on increases in the consumer price index. Subsequent to March 31, 2010 the related party lessors removed the personal guarantees of the debt related to two additional properties. As a result, the Company in 2010 derecognized approximately $4.4 million in real estate subject to finance obligation, $4.5 million in finance obligation. During 2011 the related party lessors completed construction of 2 properties. Upon completion we entered into a new master lease arrangement with the related party lessors for these 2 properties as well as an existing property under lease. The initial term of the new master lease arrangement is 15 years with four 5 year renewal options. Annual payments, including executory costs, total approximately $0.7 million pursuant to the master lease. The lease payments are scheduled to increase annually based on increases in the consumer price index.

(10) Real Estate Subject to Finance Obligation (Continued)

The net book values of real estate subject to finance obligation are summarized as follows:

(in thousands):	December 31, 2011	December 31, 2010
Land	$ 337	$ 39
Leasehold Improvements	10,435	7,750
Construction-in-progress	3,825	945
Accumulated depreciation	(878)	(634)
	$13,719	$8,100

Depreciation expense relating to real estate subject to finance obligation is classified in depreciation and amortization in the accompanying consolidated statements of comprehensive loss.

Future payments of the finance obligation as of December 31, 2011, are as follows:

(in thousands):	Finance Obligation
2012	$ 1,264
2013	1,410
2014	1,427
2015	1,444
2016	1,444
Thereafter	11,064
	$ 18,053
Less: amounts representing ground lease	(756)
Less: amounts representing interest	(12,505)
Finance obligation balance at end of lease term	9,474
Finance obligation	$ 14,266
Less: amount representing current portion	(161)
Finance obligation, less current portion	$ 14,105

Interest expense relating to the finance obligation was approximately $0.8 million, $2.3 million, and $6.6 million for the years ended December 31, 2011, 2010 and 2009, respectively. Facility rent expense relating to real estate subject to finance obligation was approximately $1.0 million, $0.6 million, and $2.1 million for the years ended December 31, 2011, 2010 and 2009, respectively.

(11) Reconciliation of total equity

The consolidated financial statements include the accounts of the Company and its majority owned subsidiaries. Noncontrolling interests-nonredeemable principally represent minority shareholders' proportionate share of the equity of certain consolidated majority owned entities of the Company. The Company has certain arrangements whereby the noncontrolling interest may be redeemed upon the occurrence of certain events outside of the Company's control. These noncontrolling interests have been classified outside of permanent equity on the Company's consolidated balance sheets. The

(11) Reconciliation of total equity (Continued)

noncontrolling interests are not redeemable at December 31, 2011 and 2010, and the contingent events upon which the noncontrolling interest may be redeemed is not probable of occurrence at December 31, 2011. Accordingly, the noncontrolling interests are measured at their carrying value at December 31, 2011 and 2010.

(11) Reconciliation of total equity (Continued)

The following table presents changes in total equity for the respective periods:

(in thousands):	Radiation Therapy Services Holdings, Inc. Shareholder's Equity	Noncontrolling interests—nonredeemable	Total Equity	Noncontrolling interests—redeemable
Balance, January 1, 2009	$ 616,964	$12,208	$ 629,172	$ 6,882
Net (loss) income	(9,550)	689	(8,861)	1,146
Other comprehensive income from unrealized gain on interest rate swap agreement	1,938	—	1,938	—
Other comprehensive income from share of equity investee	(137)	—	(137)	—
Stock-based compensation	962	—	962	—
Sale of interest in a subsidiary	96	154	250	—
Payment of note receivable from shareholder	25	—	25	—
Equity contribution in joint venture	—	800	800	—
Cash distributions	—	(2,142)	(2,142)	(734)
Balance, December 31, 2009	$ 610,298	$11,709	$ 622,007	$ 7,294
Net (loss) income	(115,488)	691	(114,797)	1,007
Other comprehensive income from unrealized gain on interest rate swap agreement	1,679	—	1,679	—
Other comprehensive income from share of equity investee	(201)	—	(201)	—
Issuance of limited liability company interests	156	—	156	—
Deconsolidation of noncontrolling interest	—	(78)	(78)	—
Purchase of noncontrolling interest in a joint venture	(475)	475	—	—
Stock-based compensation	1,030	—	1,030	—
Payment of note receivable from shareholder	50	—	50	—
Equity contribution in joint venture	—	608	608	—
Cash distributions	—	(2,246)	(2,246)	(930)
Balance, December 31, 2010	$ 497,049	$11,159	$ 508,208	$ 7,371
Net (loss) income	(353,441)	2,767	(350,674)	791
Other comprehensive income from unrealized gain on interest rate swap agreements	2,428	—	2,428	—
Other comprehensive income from foreign currency translation loss	(4,265)	(617)	(4,882)	(27)
Cash contribution of equity	3	—	3	—
Deconsolidation of noncontrolling interest	—	49	49	—
Equity issuance related to MDLLC acquisition	16,250	—	16,250	—
Fair value of noncontrolling interest acquired in connection with the acquisition of medical practices	—	—	—	1,364
Fair value of noncontrolling interest acquired in connection with MDLLC acquisition	—	7,750	7,750	—
Reversal of other comprehensive income of previously held equity investment	338	—	338	—
Stock-based compensation	1,461	—	1,461	—
Payment of note receivable from shareholder	50	—	50	—
Issuance of noncontrolling interest redeemable	—	—	—	71
Equity contribution in joint venture	—	—	—	4,120
Cash distributions	—	(3,687)	(3,687)	(962)
Balance, December 31, 2011	$ 159,873	$17,421	$ 177,294	$12,728

(11) Reconciliation of total equity (Continued)

Redeemable equity securities with redemption features that are not solely within the Company's control are classified outside of permanent equity. Those securities are initially recorded at their estimated fair value on the date of issuance. Securities that are currently redeemable or redeemable after the passage of time are adjusted to their redemption value as changes occur. In the event that a redeemable equity security will require redemption, then subsequent adjustments to the initially recorded amount will be recognized in the period that a redemption becomes probable.

(12) Fair Value of Financial Instruments

ASC 820 requires disclosure about how fair value is determined for assets and liabilities and establishes a hierarchy for which these assets and liabilities must be grouped, based on significant levels of inputs. The three-tier fair value hierarchy, which prioritizes the inputs used in the valuation methodologies, is as follows:

Level 1—Quoted prices for identical assets and liabilities in active markets.

Level 2—Observable inputs other than quoted prices included in Level 1, such as quoted prices for similar assets and liabilities in active markets, quoted prices for identical or similar assets and liabilities in markets that are not active, or other inputs that are observable or can be corroborated by observable market data.

Level 3—Unobservable inputs for the asset or liability.

In accordance with ASC 820, the fair value of the 9⅞% Senior Subordinated Notes due 2017 and Term Loan B portion of the senior secured credit facility ("Term Loan B") was based on prices quoted from third-party financial institutions. At December 31, 2011, the fair values are as follows (in thousands):

	Fair Value	Carrying Value
$347.0 million senior secured credit facility—(Term Loan B portion)	$261,048	$264,367
$360.0 million Senior Subordinated Notes due April 15, 2017	$273,600	$357,973
$16.25 million Senior Subordinated Notes due April 15, 2017	$ 12,350	$ 16,075

At December 31, 2010, the fair values are as follows (in thousands):

	Fair Value	Carrying Value
$347.0 million senior secured credit facility—(Term Loan B portion)	$258,700	$263,910
$310.0 million Senior Subordinated Notes due April 15, 2017	$305,400	$308,235

(12) Fair Value of Financial Instruments (Continued)

As of December 31, 2011 and 2010, we held certain items that are required to be measured at fair value on a recurring basis including interest rate swap agreements and foreign currency derivative contracts. Cash and cash equivalents are reflected in the financial statements at their carrying value, which approximate their fair value due to their short maturity. The carrying values of the Company's long-term debt other than Senior Subordinated Notes and Term Loan B approximates fair value due to the length of time to maturity and/or the existence of interest rates that approximate prevailing market rates.

The following items are measured at fair value on a recurring basis subject to the disclosure requirements of ASC 820, as of December 31, 2011 and 2010:

		Fair Value Measurements at Reporting Date Using		
(in thousands):	December 31, 2011	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Other long-term liabilities				
Interest rate swaps	$(708)	$—	$(708)	$—
Other current assets				
Foreign currency derivative contracts	$ 814	$—	$ 814	$—

		Fair Value Measurements at Reporting Date Using		
(in thousands):	December 31, 2010	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Other long-term liabilities				
Interest rate swap	$(4,966)	$—	$(4,966)	$—

The estimated fair value of the Company's interest rate swaps were determined using an approach that considers various inputs and assumptions, including LIBOR swap rates, cash flow activity, yield curves and other relevant economic measures, all of which are observable market inputs that are classified under Level 2 of the fair value hierarchy. The fair value also incorporates valuation adjustments for credit risk.

The estimated fair value of the Company's foreign currency derivative agreements considered various inputs and assumptions, including the applicable spot rate, forward rates, maturity, implied volatility and other relevant economic measures, all of which are observable market inputs that are classified under Level 2 of the fair value hierarchy. The valuation technique used is an income approach with the best market estimate of what will be realized on a discounted cash flow basis.

(13) Equity Investments in Joint Ventures

The Company currently maintains equity interests in seven unconsolidated joint ventures, a 45% interest in a joint venture with a radio-surgery facility, a 45% interest in a urology surgical facility, a

(13) Equity Investments in Joint Ventures (Continued)

28.5% interest in the development and management of a proton beam therapy center to be constructed in Manhattan, a 50% interest in an international freestanding radiation center in Mohali, India, and two joint ventures in South America.

In 2010, the Company maintained a 33% interest in Medical Developers, LLC, a joint venture which had a 57% interest in the underlying operating entities, and manages 26 radiation therapy treatment centers in South America, Central America and the Caribbean . The centers are located in Argentina, Mexico, Costa Rica, Dominican Republic, Guatemala, El Salvador and Bolivia. In March 2011, the Company purchased the remaining 67% interest in Medical Developers, LLC.

At December 31, 2010 and 2009, the Company's investment in Medical Developers, LLC was approximately $14.7 million and $13.1 million, respectively. Total member's equity as reported by Medical Developers, LLC was $26.2 million and $19.0 million at December 31, 2010 and 2009, respectively. The Company's equity in the earnings of Medical Developers, LLC for the years ended December 31, 2010 and 2009 was approximately $2.0 million and $1.5 million, respectively, which is recorded in other revenue in the accompanying consolidated statements of comprehensive loss. The Company's equity in the earnings of a controlling interest in MDLLC for the two months ended February 28, 2011 was approximately $0.3 million. Effective March 1, 2011, the Company consolidated the operations of Medical Developers, LLC.

The condensed results of operations of Medical Developers, LLC are as follows:

(in thousands):	Year Ended December 31, 2010
Total revenues	$53,152
Net income	10,940
Net income attributable to noncontrolling interests	(4,864)
Net income attributable to Medical Developers, LLC	$ 6,076

The Company utilizes the equity method to account for its investments in the unconsolidated joint ventures. At December 31, 2011 and 2010, the Company's investments in the unconsolidated joint ventures were approximately $0.7 million and $20.1 million, respectively. The Company's equity in the earnings (losses) of the equity investments in joint ventures was approximately ($1.0 million), $1.0 million, and $0.9 million years ended December 31, 2011, 2010 and 2009, respectively, which is recorded in other revenue in the accompanying consolidated statements of comprehensive loss.

(13) Equity Investments in Joint Ventures (Continued)

The condensed financial position and results of operations of the unconsolidated joint venture entities are as follows:

	December 31,	
(in thousands):	2011	2010
Total assets	$10,807	$56,497
Liabilities	$ 1,153	$15,458
Shareholders' equity	9,654	41,039
Total liabilities and shareholders' equity	$10,807	$56,497

	Year Ended December 31,		
(in thousands):	2011	2010	2009
Revenues	$ 3,152	$57,925	$43,202
Expenses	7,186	53,876	39,811
Net income (loss)	$(4,034)	$ 4,049	$ 3,391

A summary of the changes in the equity investment in the unconsolidated joint ventures is as follows:

(in thousands):	
Balance at January 1, 2009	$ 2,428
Capital contributions in joint venture	15,793
Distributions	(301)
Share of other comprehensive loss	(137)
Equity interest in net income of joint ventures	880
Balance at December 31, 2009	18,663
Capital contributions in joint venture	2,339
Distributions	(1,007)
Share of other comprehensive loss	(201)
Impairment	(659)
Equity interest in net income of joint ventures	1,001
Balance at December 31, 2010	20,136
Capital contributions in joint venture	799
Distributions	(634)
Foreign currency transaction loss	(2)
Impairment	(2,635)
Sale of investment	(312)
Consolidation of investment	(15,674)
Purchase of investment	50
Equity interest in net income of joint ventures	(1,036)
Balance at December 31, 2011	$ 692

(14) Commitments and Contingencies

Letters of Credit

The Company issued to the lessor of one of its treatment centers an unconditional and irrevocable letter of credit in the amount of $0.3 million to serve as security for the performance of the assignees' obligations under the lease. In addition, the Company issued an irrevocable letter of credit in the amount of $0.6 million relating to the Company's workers' compensation insurance program. In November 2011, the Company issued an irrevocable letter of credit in the amount of $2.0 million to a financial institution to provide to an uncommitted line of credit to three operating entities of Medical Developers LLC.

Lease Commitments

The Company is obligated under various operating leases for office space, medical equipment, and an aircraft lease. Total lease expense incurred under these leases was approximately $38.8 million, $33.1 million, and $25.7 million for the years ended December 31, 2011, 2010 and 2009, respectively.

Future fixed minimum annual lease commitments are as follows at December 31, 2011:

(in thousands):	Commitments	Less Sublease Rentals	Net Rental Commitments
2012	$ 34,778	$ 386	$ 34,392
2013	32,267	386	31,881
2014	31,463	290	31,173
2015	29,199	—	29,199
2016	28,311	—	28,311
Thereafter	226,974	—	226,974
	$382,992	$1,062	$381,930

The Company leases land and space at its treatment centers under operating lease arrangements expiring in various years through 2044. The majority of the Company's leases provide for fixed rent escalation clauses, ranging from 2.0% to 5.0%, or escalation clauses tied to the Consumer Price Index. The rent expense for leases containing fixed rent escalation clauses or rent holidays is recognized by the Company on a straight-line basis over the lease term. Leasehold improvements made by a lessee are recorded as leasehold improvements. Leasehold improvements are amortized over the shorter of their estimated useful lives (generally 39 years or less) or the related lease term plus anticipated renewals when there is an economic penalty associated with nonrenewal. An economic penalty is deemed to occur when the Company forgoes an economic benefit, or suffers an economic detriment by not renewing the lease. Penalties include, but are not limited to, impairment of existing leasehold improvements, profitability, location, uniqueness of the property within its particular market, relocation costs, and risks associated with potential competitors utilizing the vacated location. Lease incentives received are recorded as accrued rent and amortized as reductions to lease expense over the lease term.

(14) Commitments and Contingencies (Continued)

Concentrations of Credit Risk

Financial instruments, which subject the Company to concentrations of credit risk, consist principally of cash and accounts receivable. The Company maintains its cash in bank accounts with highly rated financial institutions. These accounts may, at times, exceed federally insured limits. The Company has not experienced any losses in such accounts. The Company grants credit, without collateral, to its patients, most of whom are local residents. Concentrations of credit risk with respect to accounts receivable relate principally to third- party payers, including managed care contracts, whose ability to pay for services rendered is dependent on their financial condition. For the year ended December 31, 2011, a government payor in Argentina represented approximately 30% of the total revenues earned in Argentina.

Legal Proceedings

The Company is involved in certain legal actions and claims arising in the ordinary course of its business. It is the opinion of management, based on advice of legal counsel, that such litigation and claims will be resolved without material adverse effect on the Company's consolidated financial position, results of operations, or cash flows.

On September 16, 2010, the Company was served with a civil complaint that was filed against the Company in the United States District Court for the Southern District of New York by TPTCC NY, Inc., The Proton Institute of NY, LLC and NY Medscan LLC. The complaint alleges, among other things, that in connection with a failed business venture between plaintiffs and the Company to provide proton beam therapy (PBT) services in New York City, the Company, certain of its subsidiaries and Norton Travis, the Company's general counsel, misappropriated confidential information and trade secrets of the plaintiffs and conspired in restraint of trade, engaged in unfair competition, and conspired to fix prices in seeking to establish a PBT services business in New York City. The plaintiffs seek to recover at least $350 million in damages, plus punitive damages of up to three times the amount of damages awarded. The Company intends to vigorously defend this suit. In the opinion of the Company's management, the case is without merit. By Order dated February 24, 2011, Judge Jed S. Rakoff granted the Company's motion to dismiss in its entirety dismissing all claims against all defendants including the Company and Mr. Travis.

Acquisitions

The Company has acquired and plans to continue acquiring businesses with prior operating histories. Acquired companies may have unknown or contingent liabilities, including liabilities for failure to comply with health care laws and regulations, such as billing and reimbursement, fraud and abuse and similar anti-referral laws. Although the Company institutes policies designed to conform practices to its standards following completion of acquisitions, there can be no assurance that the Company will not become liable for past activities that may later be asserted to be improper by private plaintiffs or government agencies. Although the Company generally seeks to obtain indemnification from prospective sellers covering such matters, there can be no assurance that any such matter will be covered by indemnification, or if covered, that such indemnification will be adequate to cover potential losses and fines.

(14) Commitments and Contingencies (Continued)

Employment Agreements

The Company is party to employment agreements with several of its employees that provide for annual base salaries, targeted bonus levels, severance pay under certain conditions, and certain other benefits.

(15) Retirement Plan

The Company has a defined contribution retirement plan under Section 401(a) of the Internal Revenue Code (the Retirement Plan). The Retirement Plan allows all full-time employees after one year of service to defer a portion of their compensation on a pretax basis through contributions to the Retirement Plan. The Company provides for a discretionary match based on a percentage of the employee's annual contribution. No Company match was provided for in 2011. At December 31, 2010 and 2009, the Company accrued approximately $0.6 million and $1.5 million, respectively related to the Company's approved discretionary match.

(16) Stock Option Plan and Restricted Stock Grants

Radiation Therapy Investments, LLC ("RT Investments") adopted an equity-based incentive plan in February 2008, and authorized for issuance under the plan approximately 1,494,111 units of limited liability company interests consisting of 526,262 Class B Units and 967,849 Class C Units. The units are limited liability company interests and are available for issuance to the Company's employees. As of December 31, 2011, there were 13,815 Class B Units and 51,040 Class C Units available for future issuance under the plan.

The Class B Units vest over approximately 48 months. Assuming continued employment of the employee with the Company, 25% vest on the first anniversary of the grant date, and the remaining 75% vest in three equal installments on the second, third, and fourth anniversaries from the grant date. The Class C Units vest annually for 34 months based on certain performance conditions and/or market conditions being met or achieved and, in all cases, assuming continued employment. For the Class C Units, the investment return conditions relate to Vestar Capital Partners V, L.P., majority owner of RT Investments ("Vestar") receiving a specified multiple on their investment upon a liquidity event. The performance condition relates to the Company achieving certain operating targets, and the market condition relates to holders of Preferred Units and Class A Units receiving a specified multiple on their investment upon a liquidation event. If an employee holder's employment is terminated, RT Investments may repurchase the holder's vested Class B Units and Class C Units. If the termination occurs within 12 months after the relevant measurement date, all of the Class B and Class C Units will be repurchased at the initial purchase price, or cost. If the termination occurs during the following three-year period, the Class B and Class C units may be purchased at fair market value depending on the circumstances of the holder's departure and the date of termination.

For purposes of determining the compensation expense associated with these grants, management valued the business enterprise using a variety of widely accepted valuation techniques, which considered a number of factors such as the financial performance of the Company, the values of comparable companies and the lack of marketability of the Company's equity. The Company then used the option pricing method to determine the fair value of these units at the time of grant using the following

(16) Stock Option Plan and Restricted Stock Grants (Continued)

assumptions: a term of five years, which is based on the expected term in which the units will be realized; a risk-free interest rate of 1.96% and 0.53% for grants issued in 2010 and 2011, respectively, which is the five-year U.S. federal treasury bond rate consistent with the term assumption; and expected volatility of 50% and 55% for grants issued in 2010 and 2011, respectively, which is based on the historical data of equity instruments of comparable companies.

The estimated fair value of the units, less an assumed forfeiture rate of 2.7%, is recognized in expense in the Company's consolidated financial statements on a straight-line basis over the requisite service periods of the awards for Class B Units. For Class B Units, the requisite service period is approximately 48 months, and for Class C Units, the requisite service period is 34 months only if probable of being met. The assumed forfeiture rate is based on an average historical forfeiture rate.

The Company recorded $1.5 million, $1.0 million, and $1.0 million of stock-based compensation expense for the years ended December 31, 2011, 2010 and 2009, respectively, which is included in salaries and benefits in the consolidated statements of operations. The summary of activity under the plan is presented below:

	Class B Units Outstanding	Weighted-Average Grant Date Fair Value	Class C Units Outstanding	Weighted-Average Grant Date Fair Value
Nonvested balance at end of period January 1, 2009	509,422	$ 8.14	822,806	$7.06
Units forfeited	(9,473)	8.14	(29,035)	7.06
Vested	(127,356)	8.14	—	—
Nonvested balance at end of period December 31, 2009	372,593	$ 8.14	793,771	$7.06
Units granted	16,665	10.08	43,099	8.75
Vested	(124,198)	8.14	—	—
Nonvested balance at end of period December 31, 2010	265,060	$ 8.26	836,870	$7.15
Units granted	41,662	5.49	107,748	4.88
Units forfeited	(20,831)	9.30	(119,720)	7.67
Vested	(136,697)	8.04	—	—
Nonvested balance at end of period December 31, 2011	149,194	$ 7.55	824,898	$6.78

As of December 31, 2011 there were 363,254 B units and 91,911 C units vested and outstanding.

As of December 31, 2011, there was approximately $0.3 million and $5.2 million of total unrecognized compensation expense related to the Class B Units and Class C Units, respectively. These costs are expected to be recognized over a weighted-average period of 0.8 years for Class B Units. The Class C units will be recognized if Vestar receives a specific return on their investment in the Company upon a liquidation event during the contractual life of the Class C Units.

(17) Related-Party Transactions

The Company leases certain of its treatment centers and other properties from partnerships, which are majority owned by related parties. The leases are classified in the accompanying financial statements as either operating leases or as finance obligations pursuant to ASC 840, *Leases.* These related- party leases have expiration dates through December 31, 2026, and they provide for annual payments and executory costs, ranging from approximately $58,000 to $1.7 million. The aggregate payments the Company made to the entities owned by these related parties were approximately $15.8 million, $14.5 million, and $10.2 million, for the years ended December 31, 2011, 2010 and 2009, respectively.

In October 1999, the Company entered into a sublease arrangement with a partnership, which is owned by a related parties to lease space to the partnership for an MRI center in Mount Kisco, New York. Sublease rentals paid by the partnership to the landlord were approximately $733,000, $673,000, and $761,000, for the years ended December 31, 2011, 2010 and 2009, respectively.

The Company provides billing and collection services to an MRI entity, which is owned by a related party. In addition, the Company charges the MRI entity for certain allocated cost of certain staff that perform services on behalf of the MRI entity. The fees received by the Company for the billing and collection services and for reimbursement of certain allocated costs were approximately $0, $0, and $2,000, for the years ended December 31, 2011, 2010 and 2009, respectively. No balance was due from the MRI entity at December 31, 2011 and 2010.

The Company is a participating provider in an oncology network, which is partially owned by a related party. The Company provides oncology services to members of the network. Annual payments received by the Company for the services were $884,000, $867,000, and $813,000 for the years ended December 31, 2011, 2010 and 2009, respectively.

The Company has a wholly owned subsidiary construction company that provides remodeling and real property improvements at certain of its facilities. In addition, the construction company is frequently engaged to build and construct facilities for lease that are owned by related parties. Payments received by the Company for building and construction fees were approximately $1.4 million, $0.5 million, and $0.5 million, for the years ended December 31, 2011, 2010 and 2009, respectively. Amounts due to the Company for the construction services were approximately $49,000 and $223,000 at December 31, 2011 and 2010, respectively.

The Company purchases medical malpractice insurance from an insurance company owned by a related party. The period of coverage runs from October to September. The premium payments made by the Company were approximately $5.7 million, $5.4 million, and $6.9 million, for the years ended December 31, 2011, 2010 and 2009, respectively.

In California, Delaware, Maryland, Massachusetts, Michigan, Nevada, New York, and North Carolina, the Company maintains administrative services agreements with professional corporations owned by related parties, who are licensed to practice medicine in such states. The Company entered into these administrative services agreements in order to comply with the laws of such states, which prohibit the Company from employing physicians. The administrative services agreements generally obligate the Company to provide treatment center facilities, staff, equipment, accounting services, billing and collection services, management and administrative personnel, assistance in managed care contracting, and assistance in marketing services. Fees paid to the Company by such professional

(17) Related-Party Transactions (Continued)

corporations under the administrative services agreements were approximately $79.7 million, $83.5 million, and $87.2 million, for the years ended December 31, 2011, 2010 and 2009, respectively. These amounts have been eliminated in consolidation.

On February 22, 2008, the Company entered into a management agreement with Vestar Capital Partners V, L.P. (Vestar) relating to certain advisory and consulting services for an annual fee equal to the greater of (i) $850,000 or (ii) an amount equal to 1.0% of the Company's consolidated earnings before interest, taxes, depreciation, and amortization for each fiscal year determined as set forth in the Senior Credit Facility. As part of the management agreement, the Company also paid Vestar a management fee of approximately $10.0 million for services rendered in connection with the consummation of the Merger. This management fee was allocated between goodwill, deferred financing costs, and consulting fees. As part of the management agreement, the Company agreed to indemnify Vestar and its affiliates from and against all losses, claims, damages, and liabilities arising out of the performance by Vestar of its services pursuant to the management agreement. The management agreement will terminate upon such time that Vestar and its partners and their respective affiliates hold, directly, or indirectly in the aggregate, less than 20% of the voting power of the outstanding voting stock of the Company. During the years ended December 31, 2011, 2010 and 2009, the Company incurred approximately $1.6 million, $1.3 million, and $1.2 million, respectively, of management fees and expenses under such agreement.

On April 22, 2010, affiliates of certain initial purchasers of the $310.0 million in aggregate principal amount 9⅞% senior subordinated notes due 2017 provided an additional $15.0 million of commitments to the Revolver, and increased the available commitment from $60.0 million to $75.0 million. The Company paid $2.0 million to Vestar Capital Partners V, L.P. for additional transaction advisory services in respect to the incremental amendments to the existing Senior Credit Facility, the additional $15.0 million of commitments to the revolver portion, and the complete refinancing of the senior subordinated notes.

In January 2009, the Company purchased from family members of a related party (i) a 33% interest in MDLLC, a joint venture which has a 57% interest in the underlying operating entities, and manages 26 radiation therapy treatment centers in South America, Central America and the Caribbean and (ii) a 19% interest in a joint venture, which operates a treatment center in Guatemala for approximately $10.4 million, subject to final determination of the purchase price based on a multiple of historical earnings before interest, taxes, and depreciation and amortization. In January 2010, the Company finalized the amount due for its 33% interest in the joint venture and paid an additional $1.9 million. On March 1, 2011, the Company purchased the remaining 67% interest in MDLLC. The Company also purchased an additional 61% interest in Clinica de Radioterapia La Asuncion S.A., resulting in an ownership interest of 80%. The Company consummated these acquisitions for a combined purchase price of approximately $82.7 million.

In 2010, the Company provided medical equipment and parts inventory to Medical Developers, LLC in the amount of approximately $769,000. As of December 31, 2010, amounts due from the sale of the equipment, including accrued interest were approximately $781,000. In connection with the proposed acquisition of Medical Developers, LLC, the Company advanced $500,000 for the purchase and implementation of a new accounting software system.

(18) Segment and geographic information

The Company operates in one line of business, which is operating physician group practices. As of March 1, 2011, due to the acquisition of MDLLC and Clinica de Radioterapia La Asuncion S.A., the Company's operations were restructured into two geographically organized groups: the Domestic U.S. includes eight operating segments and International is an operating segment which are aggregated into one U.S. Domestic and one International reporting segment. Prior period information is not shown as a result of the current year acquisition and since the Company previously had one reporting segment. The accounting policies of the segments are the same as those described in the summary of significant accounting policies. Transactions between reporting segments are properly eliminated. The Company assesses performance of and makes decisions on how to allocate resources to its operating segments based on multiple factors including current and projected facility gross profit and market opportunities.

Financial information by geographic segment is as follows (in thousands):

	Year ended December 31, 2011
Total revenues:	
U.S Domestic	$584,262
International	60,455
Total	$644,717
Facility gross profit:	
U.S. Domestic	$191,211
International	33,660
Total	$224,871
Depreciation and amortization:	
U.S. Domestic	$ 51,507
International	2,577
Total	$ 54,084

(18) Segment and geographic information (Continued)

	December 31, 2011
Total assets:	
U.S. Domestic	$867,448
International	131,144
Total	$998,592
Long-lived assets:	
U.S. Domestic	$223,511
International	12,900
Total	$236,411
Capital expenditures:*	
U.S. Domestic	$ 38,897
International	2,416
Total	$ 41,313

* includes capital lease obligations related to capital expenditures

Acquisition-related goodwill and intangible assets:	
U.S. Domestic	$505,008
International	93,932
Total	$598,940

Total revenues attributable to the Company's operations in Argentina were $43.5 million for the year ended December 31, 2011.

(18) Segment and geographic information (Continued)

The reconciliation of the Company's reportable segment profit and loss is as follows (in thousands):

	Year ended December 31, 2011
Facility gross profit	$ 224,871
Less:	
General and administrative expenses	81,688
General and administrative salaries	68,523
General and administrative depreciation and amortization	11,702
Provision for doubtful accounts	16,117
Interest expense, net	60,656
Loss on investments	250
Impairment loss	360,639
Gain on fair value adjustment of previously held equity investment	(234)
Foreign currency transaction loss	106
Loss on forward currency derivative contracts	672
Loss before income taxes	$(375,248)

(19) Unaudited Quarterly Financial Information

The quarterly interim financial information shown below has been prepared by the Company's management and is unaudited. It should be read in conjunction with the audited consolidated financial statements appearing herein.

	2011			
(in thousands):	**December 31,**	**September 30,**	**June 30,**	**March 31,**
Total revenues	$ 169,658	$ 156,266	$162,256	$156,537
Net loss	(111,697)	(230,327)	(4,782)	(3,077)
Net loss attributable to Radiation Therapy Services Holdings, Inc. shareholder	(112,046)	(231,029)	(5,850)	(4,516)

	2010			
(in thousands):	**December 31,**	**September 30,**	**June 30,**	**March 31,**
Total revenues	$ 137,523	$137,001	$134,906	$134,533
Net loss	(102,292)	(2,416)	(8,083)	(999)
Net loss attributable to Radiation Therapy Services Holdings, Inc. shareholder	(102,333)	(2,332)	(9,017)	(1,806)

(20) Supplemental Consolidating Financial Information

Radiation Therapy Services, Inc. (RTS) payment obligations under the senior secured credit facility and senior subordinated notes are guaranteed by Parent and certain domestic subsidiaries of RTS (Subsidiary Guarantors and, collectively with Parent, the "Guarantors"). The consolidated joint ventures and professional corporations of the Company are non-guarantors. Such guarantees are full, unconditional and joint and several. The following supplemental financial information sets forth, on an unconsolidated basis, balance sheets, statements of operations, and statements of cash flows information for Parent, the Subsidiary Guarantors and the non-guarantor subsidiaries. The supplemental financial information reflects the investment of Parent and RTS and subsidiary guarantors using the equity method of accounting.

(20) Supplemental Consolidating Financial Information (Continued)

CONSOLIDATING BALANCE SHEET
AS OF DECEMBER 31, 2011
(in thousands)

	Parent	RTS	Subsidiary Guarantors	Subsidiary Non-Guarantors	Eliminations	Consolidated
ASSETS						
Current assets:						
Cash and cash equivalents	$ 184	$ 39	$ 733	$ 9,221	$ —	$ 10,177
Accounts receivable, net	—	—	44,135	42,959	—	87,094
Intercompany receivables	6,335	—	91,477	—	(97,812)	—
Prepaid expenses	—	52	4,968	711	—	5,731
Inventories	—	—	4,140	168	—	4,308
Deferred income taxes	(35)	(1,924)	4,925	3	—	2,969
Other	4	814	4,397	810	—	6,025
Total current assets	6,488	(1,019)	154,775	53,872	(97,812)	116,304
Equity investments in joint ventures	149,377	778,355	123,310	42	(1,050,392)	692
Property and equipment, net	—	—	201,806	34,605	—	236,411
Real estate subject to finance obligation	—	—	13,719	—	—	13,719
Goodwill	—	82,491	384,001	90,055	—	556,547
Intangible assets, net	—	3,710	15,936	22,747	—	42,393
Other assets	—	17,248	7,089	8,189	—	32,526
Intercompany note receivable	—	—	—	—	—	—
Total assets	$155,865	$880,785	$900,636	$209,510	$(1,148,204)	$998,592
LIABILITIES AND EQUITY						
Current liabilities:						
Accounts payable	$ —	$ 609	$ 21,838	$ 5,301	$ —	$ 27,748
Intercompany payables	—	84,272	—	13,473	(97,745)	—
Accrued expenses	—	7,802	28,337	6,457	—	42,596
Income taxes payable	(126)	1,553	2,329	1,554	—	5,310
Current portion of long-term debt	—	—	9,923	4,022	—	13,945
Current portion of finance obligation	—	—	161	—	—	161
Other current liabilities	—	—	3,886	2,729	—	6,615
Total current liabilities	(126)	94,236	66,474	33,536	(97,745)	96,375
Long-term debt, less current portion	—	648,415	13,757	2,916	—	665,088
Finance obligation, less current portion	—	—	14,105	—	—	14,105
Other long-term liabilities	—	708	15,460	6,491	—	22,659
Deferred income taxes	(3,882)	(11,951)	21,553	4,623	—	10,343
Intercompany note payable	—	—	—	—	—	—
Total liabilities	(4,008)	731,408	131,349	47,566	(97,745)	808,570
Noncontrolling interests—redeemable	—	—	—	—	12,728	12,728
Total Radiation Therapy Services Holdings, Inc. shareholder's equity	159,873	149,377	769,287	161,944	(1,080,608)	159,873
Noncontrolling interests—nonredeemable	—	—	—	—	17,421	17,421
Total equity	159,873	149,377	769,287	161,944	(1,063,187)	177,294
Total liabilities and equity	$155,865	$880,785	$900,636	$209,510	$(1,148,204)	$998,592

(20) Supplemental Consolidating Financial Information (Continued)

CONSOLIDATING STATEMENTS OF COMPREHENSIVE INCOME (LOSS)
YEAR ENDED DECEMBER 31, 2011
(in thousands)

	Parent	RTS	Subsidiary Guarantors	Subsidiary Non-Guarantors	Eliminations	Consolidated
Revenues:						
Net patient service revenue	$ —	$ —	$ 435,258	$203,432	$ —	$ 638,690
Other revenue	—	1	6,574	488	—	7,063
(Loss) income from equity investment	(363,552)	(342,738)	2,633	(6)	702,627	(1,036)
Intercompany revenue	—	742	80,897	2	(81,641)	—
Total revenues	(363,552)	(341,995)	525,362	203,916	620,986	644,717
Expenses:						
Salaries and benefits	1,461	—	263,483	61,838	—	326,782
Medical supplies	—	—	46,590	5,248	—	51,838
Facility rent expenses	—	—	28,902	4,473	—	33,375
Other operating expenses	—	—	23,768	10,224	—	33,992
General and administrative expenses	6	1,929	68,500	11,253	—	81,688
Depreciation and amortization	—	928	46,764	6,392	—	54,084
Provision for doubtful accounts	—	—	11,276	4,841	—	16,117
Interest expense, net	(6)	58,433	2,482	(253)	—	60,656
Impairment loss	—	—	359,857	782	—	360,639
Loss (gain) on investments	—	—	251	(1)	—	250
Gain on fair value adjustment of previously held equity investment	—	—	(234)	—	—	(234)
Foreign currency transaction loss	—	—	—	106	—	106
Loss on forward currency derivative contracts	—	672	—	—	—	672
Intercompany expenses	—	—	2	81,639	(81,641)	—
Total expenses	1,461	61,962	851,641	186,542	(81,641)	1,019,965
(Loss) income before income taxes	(365,013)	(403,957)	(326,279)	17,374	702,627	(375,248)
Income tax expense	(9,735)	(37,977)	16,547	5,800	—	(25,365)
Net (loss) income	(355,278)	(365,980)	(342,826)	11,574	702,627	(349,883)
Net income attributable to noncontrolling interests—redeemable and non-redeemable	—	—	—	—	(3,558)	(3,558)
Net (loss) income attributable to Radiation Therapy Services Holdings, Inc. shareholder	(355,278)	(365,980)	(342,826)	11,574	699,069	(353,441)
Unrealized comprehensive income (loss):	—	2,428	—	(4,909)	—	(2,481)
Comprehensive (loss) income	(355,278)	(363,552)	(342,826)	6,665	702,627	(352,364)
Comprehensive income attributable to noncontrolling interests—redeemable and non-redeemable:	—	—	—	—	(2,914)	(2,914)
Comprehensive (loss) income attributable to Radiation Therapy Services Holdings, Inc. shareholder	$(355,278)	$(363,552)	$(342,826)	$ 6,665	$699,713	$ (355,278)

(20) Supplemental Consolidating Financial Information (Continued)

CONSOLIDATING STATEMENT OF CASH FLOWS
YEAR ENDED DECEMBER 31, 2011
(in thousands)

	Parent	RTS	Subsidiary Guarantors	Subsidiary Non-Guarantors	Eliminations	Consolidated
Cash flows from operating activities						
Net (loss) income	$(355,278)	$(365,980)	$(342,826)	$ 11,574	$ 702,627	$(349,883)
Adjustments to reconcile net (loss) income to net cash provided by (used in) operating activities:						
Depreciation	—	—	40,822	5,150	—	45,972
Amortization	—	928	5,942	1,242	—	8,112
Deferred rent expense	—	—	1,069	202	—	1,271
Deferred income taxes	(2,141)	(38,285)	11,220	403	425	(28,378)
Stock-based compensation	1,461	—	—	—	—	1,461
Provision for doubtful accounts	—	—	11,276	4,841	—	16,117
Loss on the sale of property and equipment	—	—	235	—	—	235
Termination of a derivative interest rate swap agreement	—	(1,880)	—	—	—	(1,880)
Impairment loss	—	—	359,857	782	—	360,639
Loss on investments	—	—	251	(1)	—	250
Gain on fair value adjustment of previously held equity investment	—	—	(234)	—	—	(234)
Loss on foreign currency transactions	—	—	—	98	—	98
Loss on forward currency derivative contracts	—	672	—	—	—	672
Amortization of debt discount	—	847	—	—	—	847
Amortization of loan costs	—	4,524	—	—	—	4,524
Equity interest in net loss (earnings) of joint ventures	363,552	342,738	(2,633)	6	(702,627)	1,036
Distribution received from unconsolidated joint ventures	—	—	52	—	—	52
Changes in operating assets and liabilities:						
Accounts receivable and other receivables	—	—	(11,807)	(8,973)	—	(20,780)
Income taxes payable	(568)	5,533	(7,076)	(1,684)	(598)	(4,393)
Inventories and other current assets	—	—	(1,552)	(100)	—	(1,622)
Prepaid expenses	—	(7)	2,536	310	—	2,839
Intercompany payable / receivable	(7,177)	61,149	(56,738)	2,593	173	—
Accounts payable	—	(15)	4,338	(1,515)	—	2,808
Accrued expenses	—	1,424	2,432	1,145	—	5,001
Net cash (used in) provided by operating activities	(151)	11,648	17,194	16,073	—	44,764
Cash flows from investing activities						
Purchases of property and equipment	—	—	(30,733)	(5,879)	—	(36,612)
Acquisition of medical practices	—	—	(63,843)	3,957	—	(59,886)
Proceeds from the sale of property and equipment	—	—	6	—	—	6
Repayments from (loans to) employees	—	—	346	(8)	—	338
Intercompany notes to / from affiliates	—	—	—	—	—	—
Contribution of capital to joint venture entities	—	(57,647)	(299)	—	57,147	(799)
Distributions received from joint venture entities	—	1,379	6,442	—	(7,240)	581
Proceeds from sale of equity interest in a joint venture	—	—	4,432	—	(4,120)	312
Proceeds from sale of investments	—	—	1,035	—	—	1,035
Purchase of investments	—	—	—	(79)	—	(79)
Payment of foreign currency derivative contracts	—	(1,486)	—	—	—	(1,486)
Change in other assets and other liabilities	3	(1)	(233)	39	—	(192)
Net cash provided by (used in) investing activities	3	(57,755)	(82,847)	(1,970)	45,787	(96,782)

(20) Supplemental Consolidating Financial Information (Continued)

CONSOLIDATING STATEMENT OF CASH FLOWS
YEAR ENDED DECEMBER 31, 2011 (Continued)
(in thousands)

	Parent	RTS	Subsidiary Guarantors	Subsidiary Non-Guarantors	Eliminations	Consolidated
Cash flows from financing activities						
Proceeds from issuance of debt	—	97,375	11,408	2,422	—	111,205
Principal repayments of debt	—	(46,500)	(10,711)	(566)	—	(57,777)
Repayments of finance obligation	—	—	(95)	—	—	(95)
Proceeds from equity contribution	3	—	57,147	—	(57,147)	3
Payments of notes receivable from shareholder	50	—	—	—	—	50
Proceeds from issuance of noncontrolling interest	—	—	—	—	4,120	4,120
Cash distributions to noncontrolling interest holders—redeemable and non-redeemable	—	—	—	—	(4,428)	(4,428)
Consolidation of noncontrolling interest	—	—	—	(33)	—	(33)
Payments of loan costs	—	(4,809)	—	—	—	(4,809)
Cash distributions to shareholders	—	—	—	(11,668)	11,668	—
Net cash provided by (used in) financing activities	53	46,066	57,749	(9,845)	(45,787)	48,236
Effect of exchange rate changes on cash and cash equivalents	—	—	—	(18)	—	(18)
Net (decrease) increase in cash and cash equivalents	(95)	(41)	(7,904)	4,240	—	(3,800)
Cash and cash equivalents, beginning of period	279	80	8,637	4,981	—	13,977
Cash and cash equivalents, end of period	$ 184	$ 39	$ 733	$ 9,221	$ —	$ 10,177

(20) Supplemental Consolidating Financial Information (Continued)

CONSOLIDATING BALANCE SHEETS
AS OF DECEMBER 31, 2010
(in thousands)

	Parent	RTS	Subsidiary Guarantors	Subsidiary Non-Guarantors	Eliminations	Consolidated
ASSETS						
Current assets:						
Cash and cash equivalents	$ 279	$ 80	$ 8,637	$ 4,981	$ —	$ 13,977
Accounts receivable, net	—	—	43,901	19,670	—	63,571
Intercompany receivables	—	—	71,519	—	(71,519)	—
Income taxes receivable	—	—	—	—	—	—
Prepaid expenses	—	45	6,549	375	—	6,969
Inventories	—	—	2,579	68	—	2,647
Deferred income taxes	(517)	1,553	1,240	—	—	2,276
Other	7	—	1,507	799	—	2,313
Total current assets	(231)	1,678	135,932	25,893	(71,519)	91,753
Equity investments in joint ventures	496,340	1,028,910	44,011	—	(1,549,125)	20,136
Property and equipment, net	—	—	207,250	22,415	—	229,665
Real estate subject to finance obligation	—	—	8,100	—	—	8,100
Goodwill	—	114,064	644,699	12,135	—	770,898
Intangible assets, net	—	12,978	71,783	475	—	85,236
Other assets	—	16,963	4,420	9,159	—	30,542
Intercompany note receivable	—	—	—	—	—	—
Total assets	$496,109	$1,174,593	$1,116,195	$70,077	$(1,620,644)	$1,236,330
LIABILITIES AND EQUITY						
Current liabilities:						
Accounts payable	$ —	$ 624	$ 17,880	$ 3,384	$ —	$ 21,888
Intercompany payables	841	59,758	—	11,037	(71,636)	—
Accrued expenses	—	6,378	26,260	3,127	—	35,765
Income taxes payable	442	(3,980)	9,405	(471)	598	5,994
Current portion of long-term debt	—	—	8,780	—	—	8,780
Current portion of finance obligation	—	—	53	—	—	53
Other current liabilities	—	—	197	—	—	197
Total current liabilities	1,283	62,780	62,575	17,077	(71,038)	72,677
Long-term debt, less current portion	—	580,645	9,406	—	—	590,051
Finance obligation, less current portion	—	—	8,515	—	—	8,515
Other long-term liabilities	—	4,966	10,002	1,013	—	15,981
Deferred income taxes	(2,223)	29,862	6,648	(335)	(425)	33,527
Intercompany note payable	—	—	—	—	—	—
Total liabilities	(940)	678,253	97,146	17,755	(71,463)	720,751
Noncontrolling interests—redeemable	—	—	—	—	7,371	7,371
Total Radiation Therapy Services Holdings, Inc. shareholder's equity	497,049	496,340	1,019,049	52,322	(1,567,711)	497,049
Noncontrolling interests—nonredeemable	—	—	—	—	11,159	11,159
Total equity	497,049	496,340	1,019,049	52,322	(1,556,552)	508,208
Total liabilities and equity	$496,109	$1,174,593	$1,116,195	$70,077	$(1,620,644)	$1,236,330

(20) Supplemental Consolidating Financial Information (Continued)

CONSOLIDATING STATEMENTS OF COMPREHENSIVE INCOME (LOSS)
YEAR ENDED DECEMBER 31, 2010
(in thousands)

	Parent	RTS	Subsidiary Guarantors	Subsidiary Non-Guarantors	Eliminations	Consolidated
Revenues:						
Net patient service revenue	$ —	$ —	$391,643	$144,270	$ —	$ 535,913
Other revenue	—	—	6,377	672	—	7,049
(Loss) income from equity investment	(113,441)	(48,528)	4,354	—	158,616	1,001
Intercompany revenue	—	569	81,966	—	(82,535)	—
Total revenues	(113,441)	(47,959)	484,340	144,942	76,081	543,963
Expenses:						
Salaries and benefits	1,030	—	244,692	36,580	—	282,302
Medical supplies	—	—	40,779	2,248	—	43,027
Facility rent expenses	—	—	25,166	2,719	—	27,885
Other operating expenses	—	—	23,965	3,138	—	27,103
General and administrative expenses	2	2,669	59,567	3,560	—	65,798
Depreciation and amortization	—	—	42,864	3,482	—	46,346
Provision for doubtful accounts	—	—	3,566	5,265	—	8,831
Interest expense, net	(9)	54,934	4,011	(431)	—	58,505
Loss on sale of assets of a radiation treatment center	—	—	1,903	—	—	1,903
Early extinguishment of debt	—	10,947	—	—	—	10,947
Impairment Loss	—	—	97,916	—	—	97,916
Intercompany expenses	—	—	—	82,703	(82,703)	—
Total expenses	1,023	68,550	544,429	139,264	(82,703)	670,563
(Loss) income before income taxes	(114,464)	(116,509)	(60,089)	5,678	158,784	(126,600)
Income tax (benefit) expense	(454)	(1,389)	(11,142)	6	169	(12,810)
Net (loss) income	(114,010)	(115,120)	(48,947)	5,672	158,615	(113,790)
Net income attributable to noncontrolling interests—redeemable and non-redeemable	—	—	—	—	(1,698)	(1,698)
Net (loss) income attributable to Radiation Therapy Services Holdings, Inc. shareholder	(114,010)	(115,120)	(48,947)	5,672	156,917	(115,488)
Unrealized comprehensive income (loss):	—	1,679	(201)	—	—	1,478
Comprehensive (loss) income	(114,010)	(113,441)	(49,148)	5,672	158,615	(112,312)
Comprehensive income attributable to noncontrolling interests-redeemable and non-redeemable:	—	—	—	—	(1,698)	(1,698)
Comprehensive (loss) income attributable to Radiation Therapy Services Holdings, Inc. shareholder	$(114,010)	$(113,441)	$(49,148)	$ 5,672	$156,917	$(114,010)

(20) Supplemental Consolidating Financial Information (Continued)

CONSOLIDATING STATEMENTS OF CASH FLOWS
YEAR ENDED DECEMBER 31, 2010
(in thousands)

	Parent	RTS	Subsidiary Guarantors	Subsidiary Non-Guarantors	Eliminations	Consolidated
Cash flows from operating activities						
Net (loss) income	$(114,010)	$(115,120)	$(48,947)	$ 5,672	$ 158,615	$(113,790)
Adjustments to reconcile net (loss) income to net cash provided by (used in) operating activities:						
Depreciation	—	—	35,581	3,430	—	39,011
Amortization	—	—	7,283	52	—	7,335
Deferred rent expense	—	—	895	285	—	1,180
Deferred income tax provision (benefit)	(1,627)	(1,335)	(15,976)	(335)	(425)	(19,698)
Stock-based compensation	1,030	—	—	—	—	1,030
Impairment Loss	—	—	97,916	—	—	97,916
Provision for doubtful accounts	—	—	3,566	5,265	—	8,831
Loss on the sale of property and equipment	—	—	734	—	—	734
Loss on sale of assets of a radiation treatment center	—	—	1,903	—	—	1,903
Write off of pro-rata debt discount	—	494	—	—	—	494
Write off of loan costs	—	1,593	—	—	—	1,593
Early Extinguishment of debt	—	10,947	—	—	—	10,947
Amortization of debt discount	—	791	—	—	—	791
Amortization of loan costs	—	3,350	—	—	—	3,350
Equity interest in net earnings of joint ventures	113,441	48,528	(4,354)	—	(158,616)	(1,001)
Distribution received from unconsolidated joint ventures	—	—	980	—	—	980
Changes in operating assets and liabilities:						
Accounts receivable and other receivables	—	—	(11,660)	(4,406)	—	(16,066)
Income taxes receivable / payable	442	1,220	4,178	39	598	6,477
Inventories	—	—	103	4	—	107
Prepaid expenses	—	(1)	4,214	212	—	4,425
Intercompany payable / receivable	732	10,900	(9,804)	(1,656)	(172)	—
Accounts payable	—	379	8,071	4	—	8,454
Accrued expenses	—	(4,483)	8,632	(163)	5	3,991
Net cash provided by (used in) operating activities	8	(42,737)	83,315	8,403	5	48,994
Cash flows from investing activities						
Purchases of property and equipment	—	—	(43,260)	(521)	—	(43,781)
Acquisition of radiation centers	—	—	(43,388)	—	—	(43,388)
Purchase of joint venture interests	—	(1,000)	—	—	—	(1,000)
Proceeds from the sale of property and equipment	—	—	1,693	—	—	1,693
Repayments from (loans to) employees	—	—	457	—	—	457
Intercompany notes to / from affiliates	—	500	—	(500)	—	—
Contribution of capital to joint venture entities	—	(8,000)	(3,711)	—	8,000	(3,711)
Proceeds from sale of equity interest in joint venture	—	—	300	308	(608)	—
Distributions received from joint venture	—	1,166	4,140	—	(5,279)	27
Change in other assets and other liabilities	—	(2,005)	(826)	28	(5)	(2,808)
Net cash provided by (used in) investing activities	—	(9,339)	(84,595)	(685)	2,108	(92,511)
Cash flows from financing activities						
Proceeds from issuance of debt (net of original issue discount of $1,950)	—	316,550	—	—	—	316,550
Principal repayments of debt	—	(260,667)	(10,628)	—	—	(271,295)
Repayments of finance obligation	—	—	(302)	—	—	(302)
Payment of call premium on senior subordinated notes	—	(5,250)	—	—	—	(5,250)
Proceeds from equity contribution	156	—	8,000	—	(8,000)	156
Payments of notes receivable from shareholder	50	—	—	—	—	50
Proceeds from issuance of noncontrolling interest	—	—	—	—	608	608
Cash distributions to noncontrolling interest holders—redeemable and non-redeemable	—	—	—	—	(3,176)	(3,176)
Deconsolidation of noncontrolling interest	—	—	—	(14)	—	(14)
Payments of loan costs	—	(12,791)	—	—	—	(12,791)
Cash distributions to shareholders	—	—	—	(8,455)	8,455	—
Net cash provided by (used in) financing activities	206	37,842	(2,930)	(8,469)	(2,113)	24,536
Net increase (decrease) in cash and cash equivalents	214	(14,234)	(4,210)	(751)	—	(18,981)
Cash and cash equivalents, beginning of period	65	14,314	12,847	5,732	—	32,958
Cash and cash equivalents, end of period	$ 279	$ 80	$ 8,637	$ 4,981	$ —	$ 13,977

(20) Supplemental Consolidating Financial Information (Continued)

CONSOLIDATING STATEMENTS OF COMPREHENSIVE INCOME (LOSS)
YEAR ENDED DECEMBER 31, 2009
(in thousands)

	Parent	RTS	Subsidiary Guarantors	Subsidiary Non-Guarantors	Eliminations	Consolidated
Revenues:						
Net patient service revenue	$ —	$ —	$369,728	$147,918	$ —	$517,646
Other revenue	—	—	4,755	1,203	—	5,958
(Loss) income from equity investment	(6,795)	52,672	4,614	—	(49,611)	880
Intercompany revenue	—	845	86,862	—	(87,707)	—
Total revenues	(6,795)	53,517	465,959	149,121	(137,318)	524,484
Expenses:						
Salaries and benefits	962	—	219,734	38,836	—	259,532
Medical supplies	—	—	43,913	1,448	—	45,361
Facility rent expenses	—	—	19,964	2,142	—	22,106
Other operating expenses	—	—	21,268	3,130	—	24,398
General and administrative expenses	2	739	50,653	3,143	—	54,537
Depreciation and amortization	—	—	43,605	2,811	—	46,416
Provision for doubtful accounts	—	—	8,526	4,345	—	12,871
Interest expense, net	(10)	53,831	9,031	(350)	—	62,502
Impairment loss	—	—	3,470	4	—	3,474
Intercompany expenses	—	—	—	87,707	(87,707)	—
Total expenses	954	54,570	420,164	143,216	(87,707)	531,197
(Loss) income before income taxes	(7,749)	(1,053)	45,795	5,905	(49,611)	(6,713)
Income tax (expense) benefit	—	7,680	(6,460)	(218)	—	1,002
Net (loss) income	(7,749)	(8,733)	52,255	6,123	(49,611)	(7,715)
Net income attributable to noncontrolling interests—redeemable and non-redeemable	—	—	—	—	(1,835)	(1,835)
Net (loss) income attributable to Radiation Therapy Services Holdings, Inc. shareholder	(7,749)	(8,733)	52,255	6,123	(51,446)	(9,550)
Unrealized comprehensive income (loss):	—	1,938	(137)	—	—	1,801
Comprehensive (loss) income	(7,749)	(6,795)	52,118	6,123	(49,611)	(5,914)
Comprehensive income attributable to noncontrolling interests-redeemable and non-redeemable:	—	—	—	—	(1,835)	(1,835)
Comprehensive (loss) income attributable to Radiation Therapy Services Holdings, Inc. shareholder	$(7,749)	$(6,795)	$ 52,118	$ 6,123	$ (51,446)	$ (7,749)

(20) Supplemental Consolidating Financial Information (Continued)

CONSOLIDATING STATEMENTS OF CASH FLOWS
YEAR ENDED DECEMBER 31, 2009
(in thousands)

	Parent	RTS	Subsidiary Guarantors	Subsidiary Non-Guarantors	Eliminations	Consolidated
Cash flows from operating activities						
Net (loss) income	$(7,749)	$ (8,733)	$ 52,255	$ 6,123	$(49,611)	$ (7,715)
Adjustments to reconcile net income (loss) to net cash provided by (used in) operating activities:						
Depreciation	—	—	29,211	2,626	—	31,837
Amortization	—	—	14,394	185	—	14,579
Deferred rent expense	—	—	2,170	1,029	—	3,199
Deferred income tax provision	(34)	(6,825)	5,524	—	—	(1,335)
Stock-based compensation	962	—	—	—	—	962
Impairment loss	—	—	3,470	4	—	3,474
Provision for doubtful accounts	—	—	8,526	4,345	—	12,871
Loss on the sale of property and equipment	—	—	1,345	(4)	—	1,341
Write-off of acquisition-related costs	—	—	812	—	—	812
Amortization of debt discount	—	1,208	—	—	—	1,208
Amortization of loan costs	—	2,850	—	—	—	2,850
Equity interest in net earnings of joint ventures	6,795	(52,672)	(4,614)	—	49,611	(880)
Changes in operating assets and liabilities:						
Accounts receivable	—	—	(58)	(3,732)	—	(3,790)
Income taxes receivable and other receivables	—	10,910	2,776	(545)	—	13,141
Inventories	—	—	14	(4)	—	10
Prepaid expenses	—	(2)	1,670	338	—	2,006
Intercompany payable / receivable	58	64,302	(64,057)	(303)	—	—
Accounts payable	—	(98)	(1,464)	597	—	(965)
Accrued expenses	—	(627)	(1,280)	(300)	(6)	(2,213)
Net cash provided by (used in) operating activities	32	10,313	50,694	10,359	(6)	71,392
Cash flows from investing activities						
Purchases of property and equipment	—	—	(33,838)	(1,605)	—	(35,443)
Acquisition of radiation centers	—	—	(2,449)	—	—	(2,449)
Restricted cash associated with earn-out provisions of acquisitions	—	—	2,269	—	—	2,269
Purchase of joint venture interests	—	—	(13,593)	—	—	(13,593)
Proceeds from the sale of property and equipment	—	—	39	105	—	144
Repayments from (loans to) employees	—	—	451	27	—	478
Contribution of capital to joint venture entities	—	—	(2,665)	—	279	(2,386)
Proceeds from sale of equity interest in joint venture	—	—	250	385	(635)	—
Distributions received from joint venture	—	1,142	3,959	—	(5,101)	—
Change in other assets and other liabilities	3	(1,976)	(1,464)	239	6	(3,192)
Net cash provided by (used in) investing activities	3	(834)	(47,041)	(849)	(5,451)	(54,172)
Cash flows from financing activities						
Principal repayments of debt	—	(18,768)	(10,925)	—	—	(29,693)
Repayments of finance obligation	—	—	(1,242)	—	—	(1,242)
Payments of notes receivable from shareholder	25	—	—	—	—	25
Proceeds from issuance of noncontrolling interest	—	—	—	—	356	356
Cash distributions to noncontrolling interest holders—redeemable and non-redeemable	—	—	—	—	(2,876)	(2,876)
Cash distributions to shareholders	—	—	—	(7,977)	7,977	—
Net cash provided by (used in) financing activities	25	(18,768)	(12,167)	(7,977)	5,457	(33,430)
Net increase (decrease) in cash and cash equivalents	60	(9,289)	(8,514)	1,533	—	(16,210)
Cash and cash equivalents, beginning of period	5	23,603	21,361	4,199	—	49,168
Cash and cash equivalents, end of period	$ 65	$ 14,314	$ 12,847	$ 5,732	—	$ 32,958

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Report of Independent Registered Public Accounting Firm

To the Board of Directors of
Medical Developers, LLC

We have audited the combined special-purpose balance sheet of Vidt Centro Médico S.A., Ceditrin—Centro de Diagnóstico y Tratamiento S.A., CITO Centro de Interconsulta y Tratamiento Oncológico S.A., Instituto Médico Dean Funes S.A., Centro de Oncología y Radioterapia de Mar del Plata S.A., Centro de Radioterapia Siglo XXI S.A., Centro de Radiaciones de la Costa S.A., Instituto Privado de Radioterapia Cuyo S.A., Centro de Radioterapia San Juan S.A., Instituto de Radiaciones Salta S.A., Centro Médico de Radioterapia Irazú S.A., Clínica de Radioterapia de Occidente S.A. de C.V., Centro de Radioterapia y Oncología Integral S.A., Centro de Radioterapia del Cibao S.A., Servicios y Soluciones Médicas S.A., Clínica de Radioterapia La Asunción S.A., Centro de Radioterapia Los Mangales S.A., Terapia Radiante S.A., Centro Oncológico de las Sierras S.A., Emprendimientos Médicos y Tecnológicos S.A., Centro de Diagnóstico y Tratamiento S.A. and EMTRO S.A., altogether entities under common control of Medical Developers, LLC (the "Company") and referred to as the "Operating Entities", as of December 31, 2011, and the related combined special-purpose statements of comprehensive income, changes in equity, and cash flows for the ten-month period from March 1, through December 31, 2011. These combined special-purpose financial statements, none of which are included herein, are the responsibility of the Company's management. Our responsibility is to express an opinion on these combined special-purpose financial statements based on our audit.

We conducted our audit in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the combined special-purpose financial statements are free of material misstatements. An audit includes consideration of internal control over financial reporting as a basis for designing audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion. An audit also includes examining, on a test basis, evidence supporting the amounts and disclosures in the combined special-purpose financial statements, assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall combined special-purpose financial statements presentation. We believe that our audit provide a reasonable basis for our opinion.

In our opinion, such combined special-purpose financial statements present fairly, in all material respects, the financial position of the Operating Entities at December 31, 2011, and the combined results of their operations and their cash flows for the ten-month period from March 1, through December 31, 2011, in conformity with accounting principles generally accepted in the United States of America.

Buenos Aires City, Argentina
Deloitte & Co. S.R.L.
March 22, 2012

/s/ DANIEL VARDE

Daniel Varde
(Partner)

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SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized, on March 22, 2012.

RADIATION THERAPY SERVICES HOLDINGS, INC.
(Registrants)

By: /s/ DANIEL E. DOSORETZ, M.D.
Daniel E. Dosoretz, M.D.
Chief Executive Officer and Director

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant in the capacities and on the date indicated.

Name	Title	Date
/s/ JAMES L. ELROD, JR. James L. Elrod, Jr.	President and Director	March 22, 2012
/s/ DANIEL E. DOSORETZ, M.D. Daniel E. Dosoretz, M.D.	Chief Executive Officer and Director (Principal Executive Officer)	March 22, 2012
/s/ BRYAN J. CAREY Bryan J. Carey	Chief Financial Officer (Principal Financial Officer)	March 22, 2012
/s/ JOSEPH BISCARDI Joseph Biscardi	Controller and Chief Accounting Officer (Principal Accounting Officer)	March 22, 2012
/s/ ANIL SHRIVASTAVA Anil Shrivastava	Director	March 22, 2012
/s/ ERIN L. RUSSELL Erin L. Russell	Vice President and Director	March 22, 2012
/s/ JAMES H. RUBENSTEIN, M.D. James H. Rubenstein, M.D.	Director	March 22, 2012
/s/ HOWARD M. SHERIDAN, M.D. Howard M. Sheridan, M.D.	Director	March 22, 2012

SUPPLEMENTAL INFORMATION TO BE FURNISHED WITH REPORTS FILED PURSUANT TO SECTION 15(d) OF THE ACT BY REGISTRANTS WHICH HAVE NOT REGISTERED SECURITIES PURSUANT TO SECTION 12 OF THE ACT

No annual report to security holders covering the registrant's last fiscal year and no proxy material have been sent to security holders with respect to any annual or other meeting of security holders.

EXHIBIT INDEX

Exhibit Number	Description
1.1	Purchase Agreement, dated as of March 1, 2011, among Radiation Therapy Services, Inc., the guarantors named therein and the several purchasers named in Schedule I thereto, incorporated herein by reference to Exhibit 1.1 to Radiation Therapy Services Holdings, Inc's Current Report on Form 8-K filed on March 7, 2011.
2.1	Membership Interest Purchase Agreement, dated January 1, 2009, among Radiation Therapy Services International, Inc., Medical Developers, LLC, Lisdey, S.A., Alejandro Dosoretz and Bernardo Dosoretz, for the purchase of membership interests in Medical Developers, LLC, incorporated herein by reference to Exhibit 2.1 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.*
2.2	Stock Purchase Agreement, dated as of April 1, 2010, by and among 21st Century Oncology of South Carolina, LLC, R. Steven Bass, M.D., Paul Goetowski, M.D. and Todd Williams, M.D. concerning the purchase of all of the outstanding capital stock of Carolina Regional Cancer Center, P.A., incorporated herein by reference to Exhibit 2.2 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
3.1	Amended and Restated Articles of Incorporation of Radiation Therapy Services, Inc. (as successor to RTS MergerCo, Inc.), incorporated herein by reference to Exhibit 3.1 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
3.2	Bylaws of Radiation Therapy Services, Inc. (as successor to RTS MergerCo, Inc.), incorporated herein by reference to Exhibit 3.2 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
3.3	Certificate of Incorporation of Radiation Therapy Services Holdings, Inc., incorporated herein by reference to Exhibit 3.3 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
3.4	Certificate of Amendment of the Certificate of Incorporation of Radiation Therapy Services Holdings, Inc., incorporated herein by reference to Exhibit 3.4 to Radiation Therapy Services Holdings, Inc.'s Annual Report on Form 10-K, filed on March 11, 2011.
3.5	Bylaws of Radiation Therapy Services Holdings, Inc., incorporated herein by reference to Exhibit 3.4 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
4.1	Registration Rights Agreement, dated April 20, 2010, by and among Radiation Therapy Services, Inc., the guarantors named therein as guarantors, Wells Fargo Securities, LLC, Barclays Capital Inc., Banc of America Securities LLC, Daiwa Capital Markets America, Inc. and Fifth Third Securities, Inc., incorporated herein by reference to Exhibit 4.1 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
4.2	Indenture, dated April 20, 2010, by and among Radiation Therapy Services, Inc., each guarantor named therein as guarantors and Wells Fargo Bank, National Association, incorporated herein by reference to Exhibit 4.2 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
4.3	First Supplemental Indenture, dated as of June 24, 2010, by and among Phoenix Management Company, LLC, Carolina Regional Cancer Center, LLC, Atlantic Urology Clinics, LLC, Radiation Therapy Services, Inc., each other then existing guarantor named therein and Wells Fargo Bank, National Association, incorporated herein by reference to Exhibit 4.3 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.

Exhibit Number	Description
4.4	Second Supplemental Indenture, dated as of September 29, 2010, by and Derm-Rad Investment Company, LLC, 21st Century Oncology of Pennsylvania, Inc., Gettysburg Radiation, LLC, Carolina Radiation and Cancer Treatment Center, Inc., 21st Century Oncology of Kentucky, LLC, New England Radiation Therapy Management Services, Inc. and Radiation Therapy School for Radiation Therapy Technology, Inc., Radiation Therapy Services, Inc., each other then existing guarantor named therein and Wells Fargo Bank, National Association, incorporated herein by reference to Exhibit 4.4 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
4.5	Third Supplemental Indenture, dated as of March 1, 2011, by and among Radiation Therapy Services, Inc. each other then existing guarantor named therein and Wells Fargo Bank, National Association, incorporated herein by reference to Exhibit 4.1 to Radiation Therapy Services Holdings, Inc's Current Report on Form 8-K filed on March 7, 2011.
4.6	Form of Notes, incorporated herein by reference to Exhibit 4.2 to Radiation Therapy Services Holdings, Inc's Current Report on Form 8-K filed on March 7, 2011.
4.7	Fourth Supplemental Indenture, dated as of March 30, 2011, by and among Aurora Technology Development, LLC, Radiation Therapy Services, Inc. each other then existing guarantor named therein and Wells Fargo Bank, National Association, incorporated herein by reference to Exhibit 4.7 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on April 1, 2011.
4.8	Fifth Supplemental Indenture, dated as of September 30, 2011 by and among Radiation Therapy Services, Inc., 21st Century Oncology Services, Inc., each other then existing guarantor named therein and Wells Fargo Bank, National Association, incorporated herein by reference to Exhibit 4.8 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 8, 2011.
4.9	Sixth Supplemental Indenture, dated as of January 25, 2012, by and among Radiation Therapy Services, Inc., Goldsboro Radiation Therapy Services, Inc., each other then existing guarantor named therein and Wells Fargo Bank, National Association.
10.1	Credit Agreement, dated February 21, 2008, by and among Radiation Therapy Services, Inc., Radiation Therapy Services Holdings, Inc., the subsidiaries of Radiation Therapy Services, Inc. identified therein as the guarantors, the institutions from time to time party thereto as lenders, Wells Fargo Bank, N.A. (as successor to Wachovia Bank, National Association), in its capacity as administrative agent for the lenders thereto and the other agents and arrangers named therein, incorporated herein by reference to Exhibit 10.1 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.2	Amendment No. 1, dated August 15, 2008, to the Credit Agreement, dated February 21, 2008, by and among Radiation Therapy Services, Inc., Radiation Therapy Services Holdings, Inc., the subsidiaries of Radiation Therapy Services, Inc. identified therein as the guarantors, the institutions from time to time party thereto as lenders, Wells Fargo Bank, N.A. (as successor to Wachovia Bank, National Association), in its capacity as administrative agent for the lenders thereto and the other agents and arrangers named therein, incorporated herein by reference to Exhibit 10.2 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010..

Exhibit Number	Description
10.3	Amendment No. 2, dated April 1, 2010, to the Credit Agreement, dated February 21, 2008, by and among Radiation Therapy Services, Inc., Radiation Therapy Services Holdings, Inc., the subsidiaries of Radiation Therapy Services, Inc. identified therein as the guarantors, the institutions from time to time party thereto as lenders, Wells Fargo Bank, N.A. (as successor to Wachovia Bank, National Association), in its capacity as administrative agent for the lenders thereto and the other agents and arrangers named therein, incorporated herein by reference to Exhibit 10.3 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.4	Incremental Amendment, dated April 22, 2010, to the Credit Agreement dated February 21, 2008, by and among the Radiation Therapy Services, Inc., Radiation Therapy Services Holdings, Inc., the subsidiaries of Radiation Therapy Services, Inc. identified therein as the guarantors, the institutions from time to time party thereto as lenders, Wells Fargo Bank, N.A. (as successor to Wachovia Bank, National Association), in its capacity as administrative agent for the lenders thereto and the other agents and arrangers named therein and Barclays Bank PLC, as Incremental Revolving Lender, incorporated herein by reference to Exhibit 10.4 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.5	Incremental Amendment, dated April 22, 2010, to the Credit Agreement dated February 21, 2008, by and among the Radiation Therapy Services, Inc., Radiation Therapy Services Holdings, Inc., the subsidiaries of Radiation Therapy Services, Inc. identified therein as the guarantors, the institutions from time to time party thereto as lenders, Wells Fargo Bank, N.A. (as successor to Wachovia Bank, National Association), in its capacity as administrative agent for the lenders thereto and the other agents and arrangers named therein and Bank of America, N.A., as Incremental Revolving Lender, incorporated herein by reference to Exhibit 10.5 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.6	Waiver and Amendment No. 3, dated May 3, 2010, to the Credit Agreement, dated February 21, 2008, by and among Radiation Therapy Services, Inc., Radiation Therapy Services Holdings, Inc., the subsidiaries of Radiation Therapy Services, Inc. identified therein as the guarantors, the institutions from time to time party thereto as lenders, Wells Fargo Bank, N.A. (as successor to Wachovia Bank, National Association), in its capacity as administrative agent for the lenders thereto and the other agents and arrangers named therein, incorporated herein by reference to Exhibit 10.6 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.7	Management Agreement, dated February 21, 2008, among Radiation Therapy Services, Inc., Radiation Therapy Services Holdings, Inc., Radiation Therapy Investments, LLC and Vestar Capital Partners, Inc., incorporated herein by reference to Exhibit 10.7 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.8	Amended and Restated Securityholders Agreement, dated March 25, 2008, by and among Radiation Therapy Investments, LLC and the other Securityholders party thereto, incorporated herein by reference to Exhibit 10.8 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.9	Form of Management Stock Contribution and Unit Subscription Agreement (Preferred Units and Class A Units), incorporated herein by reference to Exhibit 10.9 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.10	Management Stock Contribution and Unit Subscription Agreement (Preferred Units and Class A Units), dated February 21, 2008, by and between Radiation Therapy Investments, LLC and Daniel E. Dosoretz, incorporated herein by reference to Exhibit 10.10 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.+

Exhibit Number	Description
10.11	Form of Management Unit Subscription Agreement (Class B Units and Class C Units), incorporated herein by reference to Exhibit 10.11 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.12	Purchase and Sale Agreement, dated September 30, 2008, among Nationwide Health Properties, Inc., 21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc., Maryland Radiation Therapy Management Services, LLC f/k/a Maryland Radiation Therapy Management Services, Inc., Phoenix Management Company, LLC and American Consolidated Technologies, LLC for certain properties located in Florida, Maryland and Michigan, incorporated herein by reference to Exhibit 10.12 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.13	Master Lease, dated September 30, 2008, among Nationwide Health Properties, Inc., 21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc., Maryland Radiation Therapy Management Services, LLC f/k/a Maryland Radiation Therapy Management Services, Inc., Phoenix Management Company, LLC and American Consolidated Technologies, LLC for certain facilities located in Florida, Maryland and Michigan, incorporated herein by reference to Exhibit 10.3 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.14	Master Lease, dated March 31, 2010, as amended by that certain First Amendment to Master Lease, dated April 15, 2010, among Theriac Rollup, LLC, and its wholly-owned subsidiaries as Landlord and Arizona Radiation Therapy Management Services, Inc., 21st Century Oncology, LLC, 21st Century Oncology Management Services, Inc., 21st Century Oncology of El Segundo, LLC, 21st Century Oncology of Kentucky, LLC, Nevada Radiation Therapy Management Services, Inc., West Virginia Radiation Therapy Services, Inc., 21st Century Oncology of New Jersey, Inc., Central Massachusetts Comprehensive Cancer Center, LLC, Jacksonville Radiation Therapy Services, Inc., 21st Century Oncology of Jacksonville, Inc., California Radiation Therapy Management Services, Inc. and Palms West Radiation Therapy, LLC, collectively as Tenant for certain facilities located in Arizona, California, Florida, Kentucky, Massachusetts, New Jersey, Nevada and West Virginia, as guaranteed by Radiation Therapy Services, Inc, incorporated herein by reference to Exhibit 10.14 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.15	Lease, dated December 29, 2009, between Theriac Enterprises of Peoria, LLC and Arizona Radiation Therapy Management Services, Inc., for premises in Peoria, Arizona, incorporated herein by reference to Exhibit 10.15 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.16	Lease, dated December 29, 2009, between Theriac Enterprises of Gilbert, LLC and Arizona Radiation Therapy Management Services, Inc., for premises in Gilbert, Arizona, incorporated herein by reference to Exhibit 10.16 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.17	Lease, dated December 29, 2009, between Theriac Enterprises of Rancho Mirage, LLC and California Radiation Therapy Management Services, Inc., for premises in Rancho Mirage, California, incorporated herein by reference to Exhibit 10.17 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.18	Lease, dated December 29, 2009, between Theriac Enterprises of Bradenton, LLC and 21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc., for premises in Lakewood Ranch, Florida, incorporated herein by reference to Exhibit 10.18 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.

Exhibit Number	Description
10.19	Lease, dated December 29, 2009, between Theriac Enterprises of Hammonton, LLC and 21st Century Oncology of New Jersey, Inc., for premises in Hammonton, New Jersey, incorporated herein by reference to Exhibit 10.19 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.20	Lease, dated effective December 11, 2008, between Theriac Enterprises of Jacksonville, LLC and 21st Century Oncology of Jacksonville, Inc., for premises in Jacksonville, Florida, incorporated herein by reference to Exhibit 10.20 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.21	Master Lease Agreement, dated December 21, 2010, between Theriac Rollup 2, LLC and West Virginia Radiation Therapy Services, Inc. for premises in Princeton, West Virginia, incorporated herein by reference to Exhibit 10.21 to Radiation Therapy Services Holdings, Inc.'s Form 10-K filed on March 11, 2011.
10.22	Lease Agreement, dated September 16, 2008, as amended by that certain Second Amendment to Lease, effective July 1, 2008, and Third Amendment to Lease, dated December 31, 2009, between Theriac Enterprises of Harrington, LLC and Central Massachusetts Comprehensive Cancer Center, LLC, for premises in Southbridge, Massachusetts, incorporated herein by reference to Exhibit 10.22 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.23	Ground Lease, dated September 15, 2008, between Harrington Memorial Hospital, Inc. and Central Massachusetts Comprehensive Cancer Center, LLC, for premises in Southbridge, Massachusetts, incorporated herein by reference to Exhibit 10.23 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.24	Construction Sublease, dated September 16, 2008, among Harrington Memorial Hospital, Inc., Central Massachusetts Comprehensive Cancer Center, LLC and Theriac Enterprises of Harington, LLC, for premises in Southbridge, Massachusetts, incorporated herein by reference to Exhibit 10.24 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.25	Lease, dated September 16, 2008, between Theriac Enterprises of Harington, LLC and Harrington Memorial Hospital, Inc., for premises in Southbridge, Massachusetts, incorporated herein by reference to Exhibit 10.25 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.26	Blanket Amendment to Leases, dated effective May 5, 2008, amending the: (i) Ground Lease between Harrington Memorial Hospital, Inc. and Central Massachusetts Comprehensive Cancer Center, LLC, (ii) Construction Sublease, among Harrington Memorial Hospital, Inc., Central Massachusetts Comprehensive Cancer Center, LLC and Theriac Enterprises of Harington, LLC, (iii) Lease, between Central Massachusetts Comprehensive Cancer Center, LLC and Theriac Enterprises of Harington, LLC, and (iv) Lease, between Theriac Enterprises of Harington, LLC and Harrington Memorial Hospital, Inc., for premises in Southbridge, Massachusetts, incorporated herein by reference to Exhibit 10.26 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.27	Lease Agreement, dated August 21, 2007, as amended by that certain First Amendment to Lease Agreement, dated December 31, 2009, between Theriac Enterprises of Scottsdale, LLC and Arizona Radiation Therapy Management Services, Inc., for premises in Scottsdale, Arizona, incorporated herein by reference to Exhibit 10.27 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.

Exhibit Number	Description
10.28	Lease, dated October 4, 1996, as amended by that certain First Amendment to Lease, dated December 31, 2009, between 445 Partners, LLC and North Carolina Radiation Enterprises, LLC, for premises in Asheville, North Carolina, incorporated herein by reference to Exhibit 10.28 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.29	Lease Agreement effective July 1, 1987, between Kyle, Sheridan & Thorn Associates and 21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc., as successor in interest to Katin, Dosoretz Radiation Therapy Associates, P.A., for premises in Ft. Myers, Florida, incorporated herein by reference to Exhibit 10.29 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.30	Lease, dated December 3, 1999, as amended by that certain First Amendment to Lease, dated December 31, 2009, between Henderson Radiation Associates and Nevada Radiation Therapy Management Services, Inc., for premises in Henderson, Nevada, incorporated herein by reference to Exhibit 10.30 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.31	Lease, dated August 1, 2007, as amended by that certain First Amendment to Lease, dated December 31, 2009, between Nevada Radiation Enterprises, LLC and Nevada Radiation Therapy Management Services, Inc., for premises in Las Vegas, Nevada, incorporated herein by reference to Exhibit 10.31 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.32	Lease, dated December 31, 1999, as amended by that certain First Amendment to Lease, dated December 31, 2009, between Tamarac Radiation Associates and 21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc., for premises in Tamarac, Florida, incorporated herein by reference to Exhibit 10.32 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.33	Lease, dated January 1, 2001, as amended by that certain First Amendment to Lease, dated December 3, 2009, between Bonita Radiation Associates and 21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc., for premises in Bonita Springs, Florida, incorporated herein by reference to Exhibit 10.33 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.34	Lease Agreement, dated May 21, 2001, between Fort Walton Radiation Associates, LLP and 21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc., for premises in Fort Walton Beach, Florida, incorporated herein by reference to Exhibit 10.34 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.35	Lease Agreement, dated January 18, 2005, as amended by that certain First Amendment to Lease Agreement, dated December 31, 2009, between Fort Walton Beach Radiation Enterprises, LLC and 21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc., for premises in Fort Walton Beach, Florida, incorporated herein by reference to Exhibit 10.35 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.36	Lease Agreement, dated November 17, 2000, as amended by that certain First Amendment to Lease, dated December 31, 2009, between West Palm Radiation Associates, LLC and Palms West Radiation Associates, LLC, for premises in Palm Beach County, Florida, incorporated herein by reference to Exhibit 10.36 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.

Exhibit Number	Description
10.37	Lease, dated May 1, 2002, between Bradenton Radiation Associates and 21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc., as amended by that certain First Amendment to Lease, dated December 31, 2009, for premises in Bradenton, Florida, incorporated herein by reference to Exhibit 10.37 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.38	Lease Agreement, dated October 1, 2002, between 21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc. and Plantation Radiation Associates, for premises in Plantation, Florida, incorporated herein by reference to Exhibit 10.38 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.39	Lease Agreement, dated January 21, 2003, as amended by that certain First Amendment to Lease, dated December 31, 2009, between Yonkers Radiation Enterprises, LLC and New York Radiation Therapy Management Services, Incorporated, for premises in Yonkers, New York, incorporated herein by reference to Exhibit 10.39 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.40	Lease, dated February 1, 2003, as amended by that certain First Amendment to Lease, dated December 31, 2009, between Lehigh Radiation Associates and 21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc., for premises in Lehigh Acres, Florida, incorporated herein by reference to Exhibit 10.40 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.41	Lease, dated November 19, 2003, as amended by that certain First Amendment to Lease, dated December 31, 2009, between Destin Radiation Enterprises, LLC and 21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc., for premises in Santa Rosa Beach, Florida, incorporated herein by reference to Exhibit 10.41 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.42	Sublease agreement dated October 21, 1999 between Radiation Therapy Services, Inc. and Westchester MRI Specialists, P.C, incorporated herein by reference to Exhibit 10.42 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.43	Lease, dated June 1, 2005, as amended by that certain First Amendment to Lease Agreement, dated December 31, 2009, between Arizona Radiation Enterprises, LLC and Arizona Radiation Therapy Management Services, Inc., for premises in Scottsdale, Arizona, incorporated herein by reference to Exhibit 10.43 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.44	Lease, dated January 30, 2003, effective February 20, 2004, as amended by that certain First Amendment to Lease, dated December 31, 2009, between Crestview Radiation Enterprises, LLC and 21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc., for premises in Crestview, Florida, incorporated herein by reference to Exhibit 10.44 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.45	Lease, dated October 2005, as amended by that certain First Amendment to Lease Agreement, dated December 31, 2009, between Palm Springs Radiation Enterprises, LLC and California Radiation Therapy Management Services, Inc., for premises in Palm Desert, California, incorporated herein by reference to Exhibit 10.45 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.46	Lease Agreement, dated February 7, 2007, as amended by that certain First Amendment to Lease, dated December 31, 2009, between Theriac Enterprises of Littlestown, LLC and 21st Century Oncology of Pennsylvania, Inc., for premises in Littlestown, Pennsylvania, incorporated herein by reference to Exhibit 10.46 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.

Exhibit Number	Description
10.47	Lease Agreement, dated March 12, 2007, as amended by that certain First Amendment to Lease Agreement, dated December 31, 2009, between Theriac Enterprises of Casa Grande, LLC and Arizona Radiation Therapy Management Services, Inc., for premises in Casa Grande, Arizona, incorporated herein by reference to Exhibit 10.47 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.48	Lease Agreement, dated August 17, 2007, as amended by that certain First Amendment to Lease, dated December 31, 2009, between Marco Island Radiation Enterprises, LLC and 21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc., for premises in Naples, Florida, incorporated herein by reference to Exhibit 10.48 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.49	Administrative Services Agreement, dated January 1, 1997, as amended by that certain Addendum to Administrative Services Agreement, dated January 1, 2008, Addendum to Administrative Services Agreement, dated January 1, 2009, Addendum to Administrative Services Agreement, dated January 1, 2010, between New York Radiation Therapy Management Services, Incorporated and Yonkers Radiation Medical Practice, P.A. (incorporated herein by reference to Exhibit 10.49 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010), Addendum to Administrative Services Agreement, dated January 1, 2011, between New York Radiation Therapy Management Services, LLC f/k/a New York Radiation Therapy Management Services, Inc. and Yonkers Radiation Medical Practice, P.A.,(incorporated herein by reference to Exhibit 10.49 to Radiation Therapy Services, Inc.'s Form 10-K filed on March 11, 2011) and Addendum to Administrative Services Agreement, dated January 1, 2012, between New York Radiation Therapy Management Services, LLC and Yonkers Radiation Medical Practice, P.A.,.
10.50	Administrative Services Agreement, dated January 1, 2002, as amended by that certain Addendum to Administrative Services Agreement, dated January 1, 2002, Addendum to Administrative Services Agreement, dated January 1, 2004, Addendum to Administrative Services Agreement, dated January 1, 2005, Addendum to Administrative Services Agreement, dated January 1, 2006, Addendum to Administrative Services Agreement, dated January 1, 2008, Addendum to Administrative Services Agreement, dated January 1, 2009, Addendum to Administrative Services Agreement, dated January 1, 2010, between North Carolina Radiation Therapy Management Services, LLC f/k/a North Carolina Radiation Therapy Management Services, Inc. and Radiation Therapy Associates of Western North Carolina, P.A. (incorporated herein by reference to Exhibit 10.50 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010), Addendum to Administrative Services Agreement, dated January 1, 2011, between North Carolina Radiation Therapy Management Services, LLC and Radiation Therapy Associates of Western North Carolina, P.A., (incorporated herein by reference to Exhibit 10.50 to Radiation Therapy Services, Inc.'s Form 10-K filed on March 11, 2011) and Addendum to Administrative Services Agreement, dated January 1, 2012, between North Carolina Radiation Therapy Management Services, LLC and Radiation Therapy Associates of Western North Carolina, P.A.,.

Exhibit Number	Description
10.51	Administrative Services Agreement, dated January 9, 1998, as amended by that certain Amendment to Administrative Services Agreement, dated January 1, 1999, Amendment to Administrative Services Agreement, dated January 1, 1999, Amendment to Administrative Services Agreement, January 1, 2001, Amendment to Administrative Services Agreement, January 1, 2002, Amendment to Administrative Services Agreement, January 1, 2003, Amendment to Administrative Services Agreement, January 1, 2004, Amendment to Administrative Services Agreement, January 1, 2005, Amendment to Administrative Services Agreement, January 1, 2006, and Amendment to Administrative Services Agreement, August 1, 2006, between Nevada Radiation Therapy Management Services, Incorporated and Michael J. Katin, M.D., Prof. Corp., incorporated herein by reference to Exhibit 10.51 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.52	Administrative Services Agreement, dated October 31, 1998, as amended by that certain Amendment to Administrative Services Agreement effective April 1, 2005, Addendum to Administrative Services Agreement, dated January 1, 2008, Addendum to Administrative Services Agreement, dated January 1, 2009, Addendum to Administrative Services Agreement, dated January 1, 2010, between Maryland Radiation Therapy Management Services LLC f/k/a Maryland Radiation Therapy Management Services, Inc. and Katin Radiation Therapy, P.A. (incorporated herein by reference to Exhibit 10.52 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010), Addendum to Administrative Services Agreement, dated January 1, 2011, between Maryland Radiation Therapy Management Services, LLC and Katin Radiation Therapy, P.A., incorporated herein by reference to Exhibit 10.52 to Radiation Therapy Services, Inc.'s Form 10-K filed on March 11, 2011).
10.53	Professional Services Agreement, dated January 1, 2005, between Berlin Radiation Therapy Treatment Center, LLC and Katin Radiation Therapy, P.A., incorporated herein by reference to Exhibit 10.53 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.54	Independent Contractor Agreement, dated October 18, 2005, between Katin Radiation Therapy, P.A. and Ambergris, LLC, incorporated herein by reference to Exhibit 10.54 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.55	Administrative Services Agreement, dated August 1, 2003, as amended by that certain Amendment to Administrative Services Agreement, dated January 1, 2005, between California Radiation Therapy Management Services, Inc. and 21st Century Oncology of California, a Medical Corporation, incorporated herein by reference to Exhibit 10.55 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.56	Management Services Agreement, dated May 1, 2006, between 21st Century Oncology of California, a Medical Corporation and California Radiation Therapy Management Services, Inc., as successor by assignment pursuant to that certain Assignment and Assumption Agreement, dated May 1, 2006, between California Radiation Therapy Management Services, Inc. and LHA, Inc., as amended by that certain Addendum to Management Services Agreement, dated August 1, 2006, Second Amendment to Management Services Agreement, dated November 1, 2006, and Third Addendum to Management Services Agreement, dated August 1, 2007, for premises in Palm Desert, Santa Monica and Beverly Hills, California, incorporated herein by reference to Exhibit 10.56 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.

Exhibit Number	Description
10.57	Facilities and Management Services Agreement, dated October 13, 2008, among 21st Century Oncology—CHW, LLC, 21st Century Oncology of California, A Medical Corporation and Redding Radiation Oncologists, P.C., incorporated herein by reference to Exhibit 10.57 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.58	Five Party Agreement, dated May 5, 2009, among Central Massachusetts Comprehensive Cancer Center, LLC, Harrington Memorial Hospital, Inc., Theriac Enterprises of Harrington, LLC, Bank of America, N.A., and Alliance Oncology, LLC, incorporated herein by reference to Exhibit 10.58 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.59	Management Services Agreement, dated June 1, 2005, as amended by that certain Addendum, dated January 1, 2006, between New England Radiation Therapy Management Services, Inc. and Massachusetts Oncology Services, P.C., incorporated herein by reference to Exhibit 10.59 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.60	Professional Services Agreement, dated January 1, 2009, between Radiosurgery Center of Rhode Island, LLC and Massachusetts Oncology Services, P.C., incorporated herein by reference to Exhibit 10.60 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.61	Radiation Therapy Services Agreement, dated as of January 1, 2010, between South County Radiation Therapy, LLC and Massachusetts Oncology Services, P.C., incorporated herein by reference to Exhibit 10.61 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.62	Radiation Therapy Services Agreement, dated as of January 1, 2010 between Southern New England Regional Cancer Center, LLC and Massachusetts Oncology Services, P.C., incorporated herein by reference to Exhibit 10.62 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.63	Transition Agreement and Stock Pledge, dated 2008, among 21st Century Oncology—CHW, LLC, Redding Radiation Oncologists, P.C. and Michael J. Katin, M.D., incorporated herein by reference to Exhibit 10.63 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.64	Transition Agreement and Stock Pledge, dated August 2007, among American Consolidated Technologies, LLC, RADS, PC Oncology Professionals and Michael J. Katin, M.D., incorporated herein by reference to Exhibit 10.64 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.65	Transition Agreement and Stock Pledge, dated August 2007, among Phoenix Management Company, LLC, American Oncologic Associates of Michigan, P.C. and Michael J. Katin, M.D., incorporated herein by reference to Exhibit 10.63 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.66	Transition Agreement and Stock Pledge, dated August 2007, among Phoenix Management Company, LLC, X-Ray Treatment Center, P.C. and Michael J. Katin, M.D., incorporated herein by reference to Exhibit 10.66 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.

Exhibit Number	Description
10.67	Transition Agreement and Stock Pledge, dated June 1, 2005, among New England Radiation Therapy Management Services, Inc., Massachusetts Oncology Services, P.C., Daniel E. Dosoretz, M.D. and Michael J. Katin, M.D., incorporated herein by reference to Exhibit 10.67 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.68	Transition Agreement and Stock Pledge, dated September 3, 2003, among California Radiation Therapy Management Services, Inc., 21st Century Oncology of California, A Medical Corporation and Michael J. Katin, M.D., incorporated herein by reference to Exhibit 10.68 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.69	Transition Agreement and Stock Pledge, dated August 1, 2002, among North Carolina Radiation Therapy Management Services, LLC f/k/a North Carolina Radiation Therapy Management Services, Inc., Radiation Therapy Associates of Western North Carolina, P.A. and Michael J. Katin, M.D., incorporated herein by reference to Exhibit 10.69 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.70	Healthcare Professional Liability Claims Made and Healthcare General Liability Occurrence Insurance Policy, for the policy period from October 14, 2009 to October 14, 2010, issued by Batan Insurance Company SPC, LTD to Radiation Therapy Services, Inc., incorporated herein by reference to Exhibit 10.70 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.71	Excess Physician Professional Liability Insurance Policy, for the policy period from October 14, 2009 to October 14, 2010, issued by Batan Insurance Company SPC, LTD on behalf of RTSI Segregated Portfolio to Radiation Therapy Services, Inc., incorporated herein by reference to Exhibit 10.71 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.72	Excess Professional Physician and General Liability Insurance Policy, Claims Made and Reported Coverage, for the policy period from October 14, 2009 to October 14, 2010, issued by Batan Insurance Company SPC, LTD on behalf of RTSI Segregated Portfolio to Radiation Therapy Services, Inc., incorporated herein by reference to Exhibit 10.72 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.73	Physician Professional Liability Insurance Policy, the policy period from October 14, 2009 to October 14, 2010, issued by National Medical Professional Risk Retention Group, Inc. to Radiation Therapy Services, Inc./21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc., incorporated herein by reference to Exhibit 10.73 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.74	Executive Employment Agreement, dated effective as of February 21, 2008, between Radiation Therapy Services, Inc. and Daniel E. Dosoretz, incorporated herein by reference to Exhibit 10.74 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.+
10.75	Physician Employment Agreement, dated February 21, 2008, between Daniel E. Dosoretz, M.D. and 21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc., incorporated herein by reference to Exhibit 10.75 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.+
10.76	Executive Employment Agreement, dated effective as of February 8, 2010, between Radiation Therapy Services, Inc. and Kerrin E. Gillespie, incorporated herein by reference to Exhibit 10.76 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.+

Exhibit Number	Description
10.77	Executive Employment Agreement, dated effective as of February 21, 2008, between Radiation Therapy Services, Inc. and James H. Rubenstein, M.D., incorporated herein by reference to Exhibit 10.77 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.+
10.78	Executive Employment Agreement, dated effective as of February 21, 2008, as amended by that certain Amendment to Executive Employment Agreement, dated December 15, 2008 (incorporated herein by reference to Exhibit 10.78 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010) and Second Amendment to Executive Employment Agreement, dated February 2, 2011, between Radiation Therapy Services, Inc. and Norton Travis, incorporated herein by reference to Exhibit 10.78 to Radiation Therapy Services, Inc.'s Form 10-K filed on March 11, 2011.+
10.79	Executive Employment Agreement, dated effective as of February 21, 2008, between Radiation Therapy Services, Inc. and Howard Sheridan, incorporated herein by reference to Exhibit 10.79 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.+
10.80	Physician Employment Agreement, dated effective as of July 1, 2003, as amended by that certain Amendment to Physician Employment Agreement, dated January 1, 2006, Second Amendment to Physician Employment Agreement, dated October 1, 2006, and Third Amendment to Physician Employment Agreement, dated January 1, 2007, between 21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc. and Constantine A. Mantz, M.D., incorporated herein by reference to Exhibit 10.80 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.+
10.81	Physician Employment Agreement, dated effective as of January 1, 2002, as amended by that certain First Amendment to Physician Employment Agreement, dated effective as of July 1, 2002, Second Amendment to Physician Employment Agreement, dated effective as of March 24, 2007, and Third Amendment to Physician Employment Agreement, dated effective as of November 11, 2009, between 21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc. and Eduardo Fernandez, M.D., incorporated herein by reference to Exhibit 10.81 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.+
10.82	Physician Employment Agreement, dated February 21, 2008, as amended by that certain Amendment to Physician Employment Agreement, dated February 1, 2010, between James H. Rubenstein, M.D. and 21st Century Oncology, Inc., incorporated herein by reference to Exhibit 10.82 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.+
10.83	Physician Sharing Agreement, dated effective as of August 1, 2003, between 21st Century Oncology, LLC f/k/a 21st Century Oncology, Inc. and Radiation Therapy Associates of Western North Carolina, P.A., incorporated herein by reference to Exhibit 10.83 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.84	Personal and Services Agreement, dated effective as of December 1, 2004, between Imaging Initiatives, Inc and 21st Century Oncology, Inc., incorporated herein by reference to Exhibit 10.84 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.85	Business Operations and Support Agreement, dated July 20, 1999, as amended by that certain Amendment to Business Operations and Support Agreement, dated November 15, 2006, by and between Phoenix Management Company, LLC and X-Ray Treatment Center, P.C., incorporated herein by reference to Exhibit 10.85 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.

Exhibit Number	Description
10.86	Business Operations and Support Agreement, dated August 19, 2000, as amended by that certain Amendment to Business Operations and Support Agreement, dated November 15, 2006, by and between American Consolidated Technologies, LLC and RADS, P.C. Oncology Professionals, incorporated herein by reference to Exhibit 10.86 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.87	Business Operations and Support Agreement, dated August 19, 2000, as amended by that certain Amendment to Business Operations and Support Agreement, dated November 15, 2006, by and between Phoenix Management Company, LLC, as successor by merger of Pontiac Investment Associates, a Michigan Partnership and American Oncologic Associates of Michigan, P.C., incorporated herein by reference to Exhibit 10.87 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.88	Physician Sharing Agreement, dated as of October 1, 2006, between Katin Radiation Therapy, P.A. and 21st Century Oncology of Harford County, Maryland, LLC, incorporated herein by reference to Exhibit 10.88 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.89	Radiation Therapy Services Agreement, dated effective as of February 1, 2007, between Roger Williams Radiation Therapy, LLC and Massachusetts Oncology Services, P.C., incorporated herein by reference to Exhibit 10.89 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.90	Second Amended and Restated Limited Liability Company Agreement of Radiation Therapy Investments, LLC, dated March 25, 2008, incorporated herein by reference to Exhibit 10.90 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.91	Guaranty and Collateral Agreement, dated as of February 21, 2008, among Radiation Therapy Services Holdings, Inc., Radiation Therapy Services, Inc., certain subsidiaries of Radiation Therapy Services, Inc. listed therein and Wells Fargo Bank, N.A. (as successor to Wachovia Bank, National Association), incorporated herein by reference to Exhibit 10.91 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.92	Supplement No. 1, dated as of June 6, 2008, between Jacksonville Radiation Therapy Services, Inc. and Wells Fargo Bank, N.A. (as successor to Wachovia Bank, National Association), to the Guaranty and Collateral Agreement, dated as of February 21, 2008, among Radiation Therapy Services Holdings, Inc., Radiation Therapy Services, Inc., certain subsidiaries of Radiation Therapy Services, Inc. listed therein and Wells Fargo Bank, N.A., incorporated herein by reference to Exhibit 10.92 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.93	Supplement No. 2, dated as of April 22, 2010, between Phoenix Management Company, LLC and Wells Fargo Bank, N.A. (as successor to Wachovia Bank, National Association), to the Guaranty and Collateral Agreement, dated as of February 21, 2008, among Radiation Therapy Services Holdings, Inc., Radiation Therapy Services, Inc., certain subsidiaries of Radiation Therapy Services, Inc. listed therein and Wells Fargo Bank, N.A., incorporated herein by reference to Exhibit 10.93 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.

Exhibit Number	Description
10.94	Supplement No. 3, dated as of June 24, 2010, between Carolina Regional Cancer Center, LLC and Wells Fargo Bank, N.A. (as successor to Wachovia Bank, National Association), to the Guaranty and Collateral Agreement, dated as of February 21, 2008, among Radiation Therapy Services Holdings, Inc., Radiation Therapy Services, Inc., certain subsidiaries of Radiation Therapy Services, Inc. listed therein and Wells Fargo Bank, N.A., incorporated herein by reference to Exhibit 10.94 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.95	Supplement No. 4, dated as of June 24, 2010, between Atlantic Urology Clinics, LLC and Wells Fargo Bank, N.A. (as successor to Wachovia Bank, National Association), to the Guaranty and Collateral Agreement, dated as of February 21, 2008, among Radiation Therapy Services Holdings, Inc., Radiation Therapy Services, Inc., certain subsidiaries of Radiation Therapy Services, Inc. listed therein and Wells Fargo Bank, N.A., incorporated herein by reference to Exhibit 10.95 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.96	Supplement No. 5, dated as of September 30, 2010, between Derm-Rad Investment Company, LLC and Wells Fargo Bank, N.A., to the Guaranty and Collateral Agreement, dated as of February 21, 2008, among Radiation Therapy Services Holdings, Inc., Radiation Therapy Services, Inc., certain subsidiaries of Radiation Therapy Services, Inc. listed therein and Wells Fargo Bank, N.A., incorporated herein by reference to Exhibit 10.96 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.97	Supplement No. 6, dated as of September 30, 2010, between 21st Century Oncology of Pennsylvania, Inc. and Wells Fargo Bank, N.A., to the Guaranty and Collateral Agreement, dated as of February 21, 2008, among Radiation Therapy Services Holdings, Inc., Radiation Therapy Services, Inc., certain subsidiaries of Radiation Therapy Services, Inc. listed therein and Wells Fargo Bank, N.A., incorporated herein by reference to Exhibit 10.97 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.98	Supplement No. 7, dated as of September 30, 2010, between Gettysburg Radiation, LLC and Wells Fargo Bank, N.A., to the Guaranty and Collateral Agreement, dated as of February 21, 2008, among Radiation Therapy Services Holdings, Inc., Radiation Therapy Services, Inc., certain subsidiaries of Radiation Therapy Services, Inc. listed therein and Wells Fargo Bank, N.A., incorporated herein by reference to Exhibit 10.98 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.99	Supplement No. 8, dated as of September 30, 2010, between Carolina Radiation and Cancer Treatment Center, Inc. and Wells Fargo Bank, N.A., to the Guaranty and Collateral Agreement, dated as of February 21, 2008, among Radiation Therapy Services Holdings, Inc., Radiation Therapy Services, Inc., certain subsidiaries of Radiation Therapy Services, Inc. listed therein and Wells Fargo Bank, N.A., incorporated herein by reference to Exhibit 10.99 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.100	Supplement No. 9, dated as of September 30, 2010, between 21st Century Oncology of Kentucky, LLC and Wells Fargo Bank, N.A., to the Guaranty and Collateral Agreement, dated as of February 21, 2008, among Radiation Therapy Services Holdings, Inc., Radiation Therapy Services, Inc., certain subsidiaries of Radiation Therapy Services, Inc. listed therein and Wells Fargo Bank, N.A., incorporated herein by reference to Exhibit 10.100 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.

Exhibit Number	Description
10.101	Supplement No. 10, dated as of September 30, 2010, between New England Radiation Therapy Management Services, Inc. and Wells Fargo Bank, N.A., to the Guaranty and Collateral Agreement, dated as of February 21, 2008, among Radiation Therapy Services Holdings, Inc., Radiation Therapy Services, Inc., certain subsidiaries of Radiation Therapy Services, Inc. listed therein and Wells Fargo Bank, N.A., incorporated herein by reference to Exhibit 10.101 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.102	Supplement No. 11, dated as of September 30, 2010, between Radiation Therapy School for Radiation Therapy Technology, Inc. and Wells Fargo Bank, N.A., to the Guaranty and Collateral Agreement, dated as of February 21, 2008, among Radiation Therapy Services Holdings, Inc., Radiation Therapy Services, Inc., certain subsidiaries of Radiation Therapy Services, Inc. listed therein and Wells Fargo Bank, N.A., incorporated herein by reference to Exhibit 10.102 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.103	Form of Indemnification Agreement (Directors and/or Officers), incorporated herein by reference to Exhibit 10.103 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.+
10.104	Amendment No. 1, dated as of November 24, 2010, to the Second Amended and Restated Limited Liability Company Agreement of Radiation Therapy Investments, LLC, dated March 25, 2008, incorporated herein by reference to Exhibit 10.104 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on November 24, 2010.
10.105	Commitment Letter, dated January 10, 2011, by and between DDJ Capital Management, LLC and Radiation Therapy Services, Inc., incorporated herein by reference to Exhibit 10.105 to Radiation Therapy Services Holdings, Inc.'s 8-K filing on January 24, 2011.
10.106	Amended and Restated Radiation Therapy Investments, LLC 2008 Unit Award Plan, adopted on February 21, 2008, as amended and restated on March 1, 2011, incorporated herein be reference to Exhibit 10.3 to Radiation Therapy Services Holdings, Inc's Current Report on Form 8-K filed on March 4, 2011.
10.107	Membership Interest Purchase Agreement, dated as of March 1, 2011, by and among Radiation Therapy Services International, Inc., Main Film B.V., Radiation Therapy Services, Inc., Radiation Therapy Investments, LLC, Alejandro Dosoretz, and Claudia Elena Kaplan Browntein de Dosoretz, incorporated herein by reference to Exhibit 10.1 to Radiation Therapy Services Holdings, Inc's Current Report on Form 8-K filed on March 7, 2011.
10.108	Membership Interest Purchase Agreement, dated as of March 1, 2011, by and among Radiation Therapy Services International, Inc., Main Film B.V., Bernardo Dosoretz, and Eduardo Chehtman, incorporated herein by reference to Exhibit 10.2 to Radiation Therapy Services Holdings, Inc's Current Report on Form 8-K filed on March 7, 2011.
10.109	Membership Interest Purchase Agreement, dated as of March 1, 2011, by and among Radiation Therapy Services International, Inc., Radiation Therapy Services, Inc., Radiation Therapy Investments, LLC, Bernardo Dosoretz and Eduardo Chehtman, incorporated herein by reference to Exhibit 10.3 to Radiation Therapy Services Holdings, Inc's Current Report on Form 8-K filed on March 7, 2011.
10.110	Contribution Agreement, dated March 1, 2011, by and between Radiation Therapy Investments, LLC and Alejandro Dosoretz, incorporated herein by reference to Exhibit 10.4 to Radiation Therapy Services Holdings, Inc's Current Report on Form 8-K filed on March 7, 2011.

Exhibit Number	Description
10.111	Registration Rights Agreement, dated March 1, 2011, by and among Radiation Therapy Services, Inc., the guarantors party thereto and the purchasers named in Schedule II thereto, incorporated herein by reference to Exhibit 10.5 to Radiation Therapy Services Holdings, Inc's Current Report on Form 8-K filed on March 7, 2011.
10.112	Registration Rights Agreement, dated March 1, 2011, by and among Radiation Therapy Services, Inc., the guarantors party thereto and Bernardo Dosoretz, incorporated herein by reference to Exhibit 10.6 to Radiation Therapy Services Holdings, Inc's Current Report on Form 8-K filed on March 7, 2011.
10.113	Amendment No. 1, dated as of November 24, 2010, to the Second Amended and Restated Limited Liability Company Agreement of Radiation Therapy Investments, LLC, incorporated herein by reference to Exhibit 10.2 to Radiation Therapy Services Holdings, Inc's Current Report on Form 8-K filed on March 4, 2011
10.114	Amendment No. 2 to the Second Amended and Restated Limited Liability Company Agreement of Radiation Therapy Investments, LLC, incorporated herein by reference to Exhibit 10.2 to Radiation Therapy Services Holdings, Inc's Current Report on Form 8-K filed on March 4, 2011
10.115	Unit Repurchase Agreement, dated March 1, 2011, between Radiation Therapy Investments, LLC and Daniel E. Dosoretz, incorporated herein by reference to Exhibit 10.1 to Radiation Therapy Services Holdings, Inc's Current Report on Form 8-K filed on March 4, 2011
10.116	Supplement No. 12, dated as of March 31, 2011 between Aurora Technology Development, LLC and Wells Fargo Bank, N.A., to the Guaranty and Collateral Agreement, dated as of February 21, 2008, among Radiation Therapy Services Holdings, Inc., Radiation Therapy Services, Inc., certain subsidiaries of Radiation Therapy Services, Inc. listed therein and Wells Fargo Bank, N.A. , incorporated herein by reference to Exhibit 10.113 to Radiation Therapy Services, Inc.'s Registration Statement on Form S-4 filed on April 1, 2011.
10.117	Amendment Agreement, dated as of September 29, 2011, among Radiation Therapy Services, Inc. (as successor to RTS Merger Co., Inc.), Radiation Therapy Services Holdings, Inc., the Subsidiaries of the Borrower identified as "Subsidiary Guarantors" on the signature pages thereto, the Lenders signatory thereto and Wells Fargo Bank, National Association, in its capacity as administrative agent for the Lenders, incorporated by reference to Exhibit 10.1 to Radiation Therapy Services Holdings, Inc.'s Current Report on Form 8-K filed on October 3, 2011.
10.118	Incremental Amendment, dated as of September 30, 2011, among Radiation Therapy Services, Inc., a Florida corporation (as successor to RTS Merger Co., Inc.), Radiation Therapy Services Holdings, Inc., the Subsidiaries identified as "Subsidiary Guarantors" on the signature pages thereto, SunTrust Bank, as the incremental revolving lender, and Wells Fargo Bank, National Association, in its capacity as administrative agent for the Lenders, incorporated by reference to Exhibit 10.2 to Radiation Therapy Services Holdings, Inc.'s Current Report on Form 8-K filed on October 3, 2011.
10.119	Supplement No. 13, dated as of September 29, 2011, between 21st Century Oncology Services, Inc. and Wells Fargo Bank, N.A., to the Guaranty and Collateral Agreement, dated as of February 21, 2008, among Radiation Therapy Services Holdings, Inc., Radiation Therapy Services, Inc., certain subsidiaries of Radiation Therapy Services, Inc. listed therein and Wells Fargo Bank, N.A.

Exhibit Number	Description
10.120	Supplement No. 14, dated as of February 2, 2012, between Goldsboro Radiation Therapy Services, Inc. and Wells Fargo Bank, N.A., to the Guaranty and Collateral Agreement, dated as of February 21, 2008, among Radiation Therapy Services Holdings, Inc., Radiation Therapy Services, Inc., certain subsidiaries of Radiation Therapy Services, Inc. listed therein and Wells Fargo Bank, N.A.
10.121	Executive Employment Agreement, dated March 1, 2011, between Radiation Therapy Services, Inc. and Joseph M. Garcia, incorporated herein by reference to Exhibit 10.4 to Radiation Therapy Services Holdings, Inc's Current Report on Form 8-K filed on March 4, 2011.
10.122	Master Lease #3, dated as of December 12, 2011, between Theriac Rollup II, LLC and its wholly-owned subsidiaries as Landlord and 21st Century Oncology of Alabama, LLC, West Virginia Radiation Therapy Services, Inc. and 21st Century Oncology, LLC, collectively as Tenant for certain facilities, as guaranteed by Radiation Therapy Services, Inc.
12.1	Statement Re: Computation of Ratio of Earnings to Fixed Charges.
14.1	Code of Ethics, incorporated herein by reference to Exhibit 14.1 to Radiation Therapy Services Holdings, Inc.'s Form 10-K filed on March 11, 2011.
21.1	Subsidiaries of Registrant.
31.1	Certification of Principal Executive Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
31.2	Certification of Principal Financial Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
32.1	Certification of Principal Executive Officer pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
32.2	Certification of Executive Vice President and Chief Financial Officer pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
101	The following financial information from Radiation Therapy Services Holdings, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2011, formatted in Extensible Business Reporting Language (XBRL): (i) the Consolidated Balance Sheet at December 31, 2011 and December 31, 2010 (ii) the Consolidated Statements of Comprehensive Loss for the years ended December 31, 2011, 2010 and 2009 (iii) the Consolidated Statements of Cash Flows for the years ended December 31, 2011, 2010 and 2009 (iv) the Consolidated Statements of Changes in Equity for the years ended December 31, 2011, 2010 and 2009 (v) Notes to Consolidated Financial Statements.

* Schedules have been omitted pursuant to Item 601(b)(2) of Regulation S-K. The Company hereby undertakes to furnish supplemental copies of any of the omitted schedules upon request by the Securities and Exchange Commission.

\+ Management contracts and compensatory plans and arrangements.

Exhibit 12.1

Statement Regarding Computation of Ratio of Earnings to Fixed Charges
Radiation Therapy Services Holdings, Inc.

	Predecessor		Successor			
	Year Ended December 31, 2007	Period From January 1 to February 21, 2008	Period From February 22 to December 31, 2008	Year Ended December 31, 2009	Year Ended December 31, 2010	Year Ended December 31, 2011
Pre-tax income before before adjustment for noncontrolling interests in consolidated subsidiaries	42,644	(10,283)	(4,266)	(6,713)	(126,600)	(375,248)
(Income)Loss from equity investees	46	(39)	118	(880)	(1,001)	1,036
Distributed income of equity investees	—	—	—	301	1,007	633
Noncontrolling interest in pre-tax income of subsidiaries that have not incurred fixed charges	(1,211)	(19)	(2,483)	(1,835)	(1,698)	(3,558)
Fixed Charges	21,298	4,981	57,070	65,137	62,490	65,656
Earnings	62,777	(5,360)	50,439	56,010	(65,802)	(311,481)
Interest expense	20,250	4,783	55,863	63,119	59,098	61,212
An estimate of the interest within rental expense	1,048	198	1,207	2,018	3,392	4,444
Fixed Charges	21,298	4,981	57,070	65,137	62,490	65,656
Ratio of earnings to fixed charges	2.95	—	—	—	—	—
Deficiency to cover charges(2)	—	10,341	6,631	9,127	128,292	377,137

(1) For purposes of computing the ratio of earnings to fixed charges, earnings consist of income (loss) before provision for income taxes plus fixed charges. Fixed charges consist of interest expense on all indebtness including amortization of deferred financing costs and the portion of operating lease rental expense that is representative of the interest factor.

(2) Coverage deficiency represents the amount by which earnings were insufficient to cover fixed charges.

Exhibit 21.1

SUBSIDIARIES OF THE REGISTRANT

Exact Name of Additional Registrants	Jurisdiction of Incorporation or Formation
Radiation Therapy Services, Inc.	FL
21st Century Oncology Of Alabama, LLC	AL
Arizona Radiation Therapy Management Services, Inc.	AZ
California Radiation Therapy Management Services, Inc.	CA
21st Century Oncology Of Jacksonville, LLC	FL
Devoto Construction Of Southwest Florida, Inc.	FL
Radiation Therapy Services International, Inc.	FL
21st Century Oncology Management Services, Inc.	FL
Jacksonville Radiation Therapy Services, LLC	FL
Financial Services Of Southwest Florida, LLC	FL
21st Century Oncology, LLC	FL
21st Century Oncology Of Harford County Maryland, LLC	MD
Berlin Radiation Therapy Treatment Center, LLC	MD
21st Century Oncology Of Prince Georges County, Maryland, LLC	MD
Maryland Radiation Therapy Management Services, LLC	MD
American Consolidated Technologies, LLC	MI
Michigan Radiation Therapy Management Services, Inc.	MI
Nevada Radiation Therapy Management Services, Incorporated	NV
21st Century Oncology Of New Jersey, Inc.	NJ
New York Radiation Therapy Management Services, LLC	NY
North Carolina Radiation Therapy Management Services, LLC	NC
21st Century Oncology Of South Carolina, LLC	SC
West Virginia Radiation Therapy Services, Inc.	WV
Phoenix Management Company, LLC	MI
Carolina Regional Cancer Center, LLC	SC
Atlantic Urology Clinics, LLC	SC
Derm-Rad Investment Company, LLC	FL
21st Century Oncology Of Pennsylvania, Inc.	PA
Gettysburg Radiation, LLC	PA
Carolina Radiation and Cancer Treatment Center, LLC	NC
21st Century Oncology Of Kentucky, LLC	KY
New England Radiation Therapy Management Services, Inc.	MA
Radiation Therapy School For Radiation Therapy Technology, Inc.	FL
Aurora Technology Development, LLC	DE
Nebraska Radiation Therapy Management Services, Inc.	NE
21st Century Oncology Services, Inc.	DE
Goldsboro Radiation Therapy Services, Inc.	NC
Medical Developers, LLC	FL
Medical Developers Cooperatief	Netherlands
Medical Developers Holdings B.V.	Netherlands
21st Century Holdings, BV	Netherlands
Ceditrin Centro De Diagnostico y Tratamiento Integral S.A.	Argentina
Centro de Estudios y Tratamientos Oncologics S.A.	Argentina
Braquiterapia Buenos Aires, S.A.	Argentina
Centro Medico Avellaneda, S.A.	Argentina
Vidt Centro Medico S.A.	Argentina
Cito Centro de Interconsulta y Tratamiento Oncologico S.A.	Argentina
Instituto Privado de Radioterapia Cuyo S.A.	Argentina
Centro de Oncologia y Radioterapia Mar del Plata S.A.	Argentina

Exact Name of Additional Registrants	Jurisdiction of Incorporation or Formation
Instituto de Radiaciones Salta S.A.	Argentina
Instituto Medico Dean Funes S.A.	Argentina
Centro de Radioterapia Siglo XXI S.A.	Argentina
Centro de Radioterapia San Juan S.A.	Argentina
Centro de Radiaciones de la Costa S.A.	Argentina
Terapia Radiante S.A.	Argentina
Emprendimientos Medicaos Tecnologicos S.A.	Argentina
Centro de Diagnostico y Tratamiento S.A.	Argentina
EMTRO S.A.	Argentina
Centro de Radioterapia y Oncologia Integral S.A.	Dominican Republic
Centro de Radioterapia del Cibao S.A.	Dominican Republic
Centro Medico de Radioterapia Irazu S.A.	Costa Rica
Clinica de Radioterapia de Occidente S.A. de C.V.	Mexico
Servicios y Soluciones Medicas, S.A. de CV	El Salvador
Clinica de Radioterapia La Ascuncion S.A.	Guatemala
Centro de Radioterapia Los Mangales S.A.	Bolivia

Exhibit 31.1

CERTIFICATION

I, Daniel E. Dosoretz, M.D., certify that:

1. I have reviewed this Annual Report on Form 10-K of Radiation Therapy Services Holdings, Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officers and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and we have:
   a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
   b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
   c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
   d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officers and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent function):
   a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
   b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Dated: March 22, 2012

By: /s/ DANIEL E. DOSORETZ, M.D.

Daniel E. Dosoretz, M.D.
Chief Executive Officer
(principal executive officer)

Exhibit 31.2

CERTIFICATION

I, Bryan J. Carey, certify that:

1. I have reviewed this Annual Report on Form 10-K of Radiation Therapy Services Holdings, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officers and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and we have:

   a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officers and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent function):

   a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Dated: March 22, 2012

By: /s/ BRYAN J. CAREY

Bryan J. Carey
Chief Financial Officer
(principal financial officer)

Exhibit 32.1

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350,
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Annual Report of Radiation Therapy Services Holdings, Inc. (the "Company") on Form 10-K for the period ending December 31, 2011 (the "Report"), I, Daniel E. Dosoretz, M.D., Chief Executive Officer of the Company, certify, pursuant to 18 U.S.C. § 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that:

(1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

A signed original of this written certification required by Section 906 has been provided to the Company and will be retained by the Company and furnished to the Securities and Exchange Commission or its staff upon request.

/s/ DANIEL E. DOSORETZ, M.D.

Daniel E. Dosoretz, M.D.
Chief Executive Officer
(principal executive officer)
March 22, 2012

Exhibit 32.2

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350,
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Annual Report of Radiation Therapy Services Holdings, Inc. (the "Company") on Form 10-K for the period ending December 31, 2011 (the "Report"), I, Kerrin E. Gillespie, Principal Financial Officer of the Company, certify, pursuant to 18 U.S.C. § 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that:

(1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

A signed original of this written certification required by Section 906 has been provided to the Company and will be retained by the Company and furnished to the Securities and Exchange Commission or its staff upon request.

/s/ BRYAN J. CAREY

Bryan J. Carey
Chief Financial Officer
(principal financial officer)
March 22, 2012

Exhibit 5

Accelerator beam data commissioning equipment and procedures: Report of the TG-106 of the Therapy Physics Committee of the AAPM

Indra J. Das[a)]
Department of Radiation Oncology, University of Pennsylvania, Philadelphia, Pennsylvania 19104

Chee-Wai Cheng
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Ronald J. Watts
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For commissioning a linear accelerator for clinical use, medical physicists are faced with many challenges including the need for precision, a variety of testing methods, data validation, the lack of standards, and time constraints. Since commissioning beam data are treated as a reference and ultimately used by treatment planning systems, it is vitally important that the collected data are of the highest quality to avoid dosimetric and patient treatment errors that may subsequently lead to a poor radiation outcome. Beam data commissioning should be performed with appropriate knowledge and proper tools and should be independent of the person collecting the data. To achieve this goal, Task Group 106 (TG-106) of the Therapy Physics Committee of the American Association of Physicists in Medicine was formed to review the practical aspects as well as the physics of linear accelerator commissioning. The report provides guidelines and recommendations on the proper selection of phantoms and detectors, setting up of a phantom for data acquisition (both scanning and no-scanning data), procedures for acquiring specific photon and electron beam parameters and methods to reduce measurement errors ($<1\%$), beam data processing and detector size convolution for accurate profiles. The TG-106 also provides a brief discussion on the emerging trend in Monte Carlo simulation techniques in photon and electron beam commissioning. The procedures described in this report should assist a qualified medical physicist in either measuring a complete set of beam data, or in verifying a subset of data before initial use or for periodic quality assurance measurements. By combining practical experience with theoretical discussion, this document sets a new standard for beam data commissioning.
[DOI: 10.1118/1.2969070]

Key words: accelerator, commissioning, data acquisition

TABLE OF CONTENTS

I. INTRODUCTION

I.A. Purpose

Beam data commissioning should be independent of individuals collecting the data and scanning systems if it is performed with appropriate knowledge and proper tools. Data variation among beam collectors should be as minimal as possible (<1%). To achieve this goal, this report has been prepared to facilitate accelerator beam data commissioning by describing specific setup and measurement techniques, reviewing different types of radiation phantoms and detectors, discussing possible sources of error, and recommending procedures for acquiring specific photon and electron beam parameters.

I.B. Background

I.B.1. Need for commissioning data

Radiation treatment outcome is directly related to the accuracy in the delivered dose to the patient that is dependent on the accuracy of beam data used in the treatment planning process. These data are obtained during the initial commissioning of the linear accelerator and are treated as the standard data for clinical use and should be verified periodically as described by TG-40 (Ref. 1) by a qualified medical physicist to ensure that machine parameters have not changed during normal operation. For any substantial changes in a treatment planning system (TPS), for example, change in dose algorithm, additional commissioning data may be warranted based on the TPS requirements.[2]

As the manufacturing processes for linear accelerators have significantly matured, there has been an attempt by vendors to standardize machines to have identical beam characteristics. In some cases, "golden" beam data sets are provided which contain most or all of the commissioning beam data required by the TPS. If the same vendor provided the TPS, the golden beam data may already be input into the

computer. In such cases, users have the choice of measuring all the required data, or verifying a carefully selected subset of the data at time of beam commissioning. The preferred option will depend on a number of factors, such as the make and model of the accelerator and TPS, and the accuracy required for clinical use.

The following concerns should be carefully evaluated before the use of any golden beam data within a clinic. First, it is not evident that manufacturing procedures for all linear accelerators have produced a level of reproducibility acceptable for clinical use. For example, variations in beam parameters have been noted between beams with the same nominal energies.[3–5] Second, on-site changes made during installation and acceptance of the user's accelerator (e.g., changes in beam energy and/or profiles from beam steering) will not be modeled in the golden data. Third, the beam characteristics of the soft wedges are made by moving jaws that depend on the speed parameters of the jaws and a deviation at site could affect the beam profile of the soft wedge. Fourth, although acceptable agreement with the golden data set may be found in individual checks, it may be that some clinical setups will have multiple errors, which combine to produce unacceptable results. Finally, the commissioned beam data also provide a thorough check of the accelerator, which may uncover problems that may not otherwise be discovered with a mere spot check.

At a minimum, however, a golden beam dataset is an excellent source of quality assurance for verifying the user's commissioning results. These data along with those available from the Radiological Physics Center at MD Anderson Cancer Center[6–8] can be used to ensure that the user's beam data are in reasonably good agreement with those from other institutions. Monte Carlo simulation could also provide good standard data. However, measurements are still required as benchmarks for validation of any Monte Carlo[9–13] simulation.

It is beyond the scope of this report to make any specific recommendations as to what measurements are required at the time of beam commissioning of a linear accelerator. However, at a minimum, the following data should be collected during commissioning:

- For photon beams—percent depth dose (PDD) and profiles (in-plane and/or cross-plane) at various depths for open and wedge fields, data related to multileaf collimator (MLC) such as inter- and intraleaf leakage, penumbra, tongue and grove effect, etc., head (collimator) scatter, total scatter, tray, and wedge factors.
- For electron beams—PDD, profiles, cone factors, insert factors, and virtual source positions.

The commissioning measurements should be made by a qualified medical physicist. The procedures described in this report should assist in either measuring a complete set of beam data, or in verifying a subset of data before initial use or for periodic quality assurance measurements. TPS related commissioning data, as described by TG-53 (Ref. 2), should also be considered.

I.B.2. Issues with beam commissioning measurements

Even though most of the beam data measurements seem relatively simple, results could vary significantly depending upon the detector system and the phantom used. With availability of a large selection of radiation detectors covering all sizes (regular, mini- to microdetector), type (ionization chamber, semiconductor, etc.), and shapes (thimble, spherical, plane parallel), the choice of a proper detector can be overwhelming. In some situations, an improper choice of a detector may lower the quality of the collected beam data. An example of this is found in Fig. 1 that shows a wide variation in PDD of a 6 MV beam obtained with a variety of detectors for small, reference (10×10 cm^2) and large fields. The variations seem unforgiving for small and large fields.

Manufacturers often provide guidelines and tolerance limits for acceptance testing of a machine through their acceptance testing procedure. However, machine commissioning is the responsibility of the institution's qualified medical physicist. Previous task groups[14,15] provided guidelines for acceptance testing but provided no information for commissioning beam data. The recent publication[16] on acceptance testing and commissioning of linear accelerator provided details of acceptance testing of various components but did not address the commissioning aspect. There is a misconception between acceptance testing and commissioning. The acceptance testing implies the verification process of the machine based on manufacture's guidelines for a very small subset of beam data whereas commissioning is a process where a full set of data is acquired that will be used for patient treatment. There is very little information available in the literature for machine commissioning in providing dosimetry data for clinical use in radiation oncology.

I.B.3. About this task group

This task group was formed to review the physics of commissioning linear accelerators and to provide guidelines and recommendations on proper selection of detector, phantom, and methods to reduce measurement errors below $\pm1\%$ in beam data acquisition. This task group does not provide the gold standard data for a machine nor does it deal with data collection for a specific TPS. However, the task group has attempted to cover the breadth of data collection as completely as possible. The charge of this task group was aimed directly at detectors and techniques for "beam data commissioning," characterizing and documenting beam-specific behavior which is typically then used for commissioning dose calculation algorithm behavior. Although inhomogeneity correction is an important aspect to characterize, especially for contemporary algorithms (Monte Carlo and convolution/superposition) those kinds of commissioning checks are significantly more difficult to perform and are dependent on the treatment planning systems. Therefore, it seems quite reasonable for the TG report to note that the inhomogeneity measurements are an important part of commissioning, but that they are beyond the scope of the current task group report and need to be addressed by a future task group. It is also

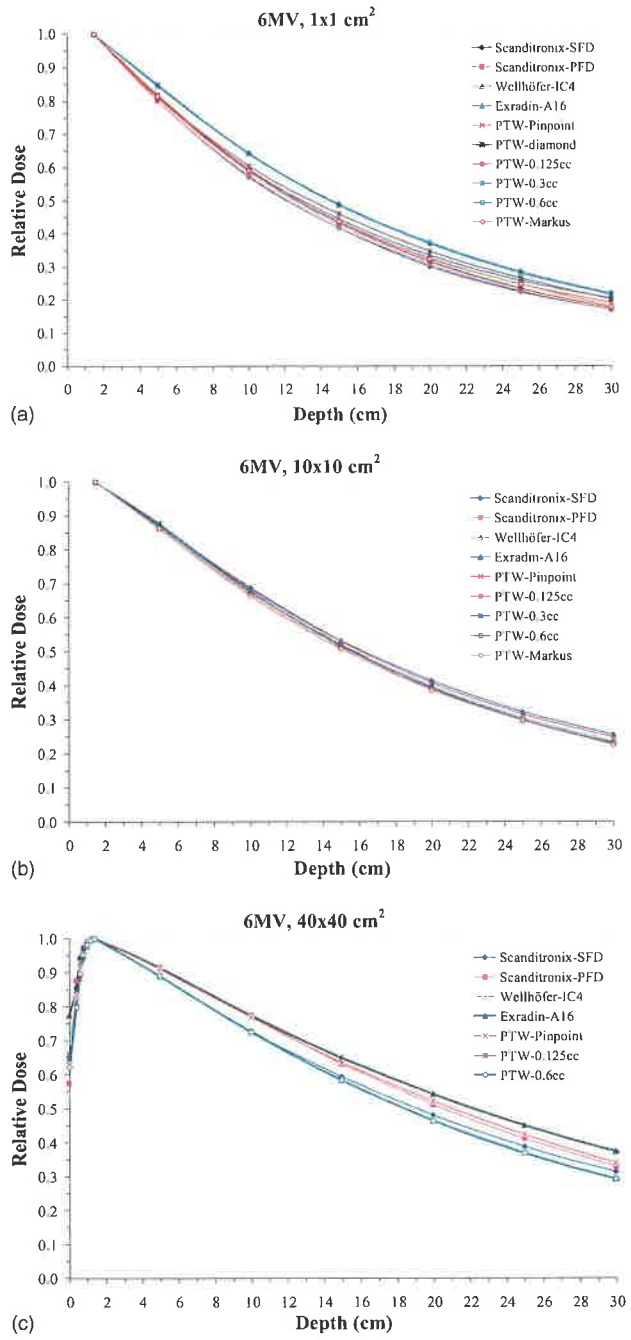

FIG. 1. Depth dose data for a 6 MV beam for (a) 1×1 cm^2, (b) 10×10 cm^2, and (c) 40×40 cm^2 fields using different detectors.

recognized that there may be an overlap of materials with other task groups such as stereotactic radiosurgery (SRS),[17] intensity modulated radiation therapy (IMRT),[18,19] head scatter (TG-74),[20] film dosimetry (TG-69),[21] electron beam (TG-70),[22] and other reports. Where appropriate, this task group refers directly to those reports. TG-106 provides recommendations and guidelines for machine commissioning, such as comprehensive data on detectors, phantoms, measuring devices (electrometer), limitations, and corrections for commercially available systems. However, it is beyond the scope of this task group to provide guidelines for any special procedures such as SRS,[17] Gamma Knife, CyberKnife, total skin electron therapy,[23] and total body irradiation.[24] This task group is limited only to the beam data commissioning for linear accelerators, i.e., photon and electron beams.

I.B.4. Commissioning effort

The amount of commissioning data requirements depend on the user's clinical need, including the TPS, monitor unit programs, in-house data tables, etc. Tables I(a) and (b) show a sample list of beam commissioning measurements for photon and electron beams. The large amount of commissioning data from 1×1 cm^2–40×40 cm^2 fields and depths ranging from 0 to 40 cm is further compounded by the number of radiation beams available from modern accelerators; 1–3 photon energies and 0–8 electrons energies, making the commissioning of a modern accelerator an enormous task. It is important that the time allowed for commissioning is determined based on both the amount of data to acquire and the availability of the physics staff. An estimate of the data acquisition time should be made prior to machine acceptance. For example, the time required for scanning six data sets (one PDD and five depth profiles) for 15 field sizes for each of five beam modifiers (one open and four physical wedges) for a dual energy accelerator could be estimated as in Eq. (1) below

$$\begin{aligned}\text{Time} \approx\ & [(\text{PDD} + 5\ \text{profiles})/\text{beam energy}] \\ & \times(\text{open} + 4\ \text{wedges}) \times (60\ \text{points/scan}) \\ & \times[1\ \text{s/pts} + 1\ \text{s(movement and delay)}] \\ & \times 15\ \text{fields} \times 2\ \text{energies} \approx 9\times10^5\ \text{s} \approx 30\ \text{h}.\end{aligned} \tag{1}$$

To account for equipment setup, change in machine parameters, machine faults, etc., typical time for photon beam scanning is 1.5 weeks. An additional week is needed for point data collection, 1–2 weeks for electrons, and a week for verification. Typically, 1–2 weeks are needed in analysis and report writing. The typical time allotted for the commissioning process is 4–6 weeks. However, additional time estimates should be made for integrating nonscanned data measurements, baseline QA readings, benchmarking, a validation of TPS data, etc., that required to be performed. The time allowed for commissioning may place pressure on the physics staff to complete the task promptly, especially in clinics with minimum physics support. Attempting to perform the commissioning quickly with minimal qualified medical physics staff may affect the quality of the data collected.

If there are multiple machines of the identical type and matched beam characteristics, there could be a fairly good agreement in the beam data, as described by Marshall[25], for low energy beam. However, quantitative evaluations of beam matching for modern machines using one-dimensional gamma analysis[26] showed that 30% of the beam profiles do not match accurately. Reduction in time is possible by elimi-

TABLE I. (a) Typical commissioning measurements for photon beam data for each energy and wedge. (b) Typical commissioning measurements for electron beam data for each energy.

(a)	Description	Square field size (cm)															
		1	2	3	4	5	6	8	10	12	14	16	20	25	30	40	>40
	Application	IMRT data							Traditional radiation oncology fields								Magna field
Scan data	PDD/TMR	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	Profiles @ 5–7 depths Diagonal or star profiles	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Nonscan data	S_c	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	S_{cp}	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	WF/TF				×	×	×	×	×	×	×	×	×	×	×		
	Surface dose	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×

(b)	Description	Cone size (cm × cm)				
		5×5	10×10	15×15	20×20	25×25
Scan data	PDD	×	×	×	×	×
	Profiles @ 5–7 depths	×	×	×	×	×
Nonscan data	Cone factor	×	×	×	×	×
	Cutout factor	×	×	×	×	×
	Virtual source	×	×	×	×	×
	Surface dose	×	×	×	×	×

nating full length of the commissioning for identical machines only when a proper analysis of a sample data set is conducted and agreement is within institutional tolerances, typically $\leq \pm 1\%$. Further time savings could be achieved by reducing the time per point acquisition, increasing the scanning speed, and reducing the time delay between successive measurements. However, reducing these scanning parameters may compromise the quality of beam data. Before embarking in such time saving measures, it is recommended that trial scans (e.g., large field beam profile scans) be performed to insure that errors are not being introduced into beam data collection.

II. PHANTOM MATERIALS, METHODS, AND DETECTORS

II.A. Phantom material

There are two types of data that are acquired during commissioning, as shown in Table I: (i) scanned data and (ii) nonscanned data or point dose data. Point dose data can be measured in a solid phantom (discussed later) or in a water phantom. Scanned beam data collection is carried out with a scanning water phantom; typically, a plastic tank filled with water to a level deep enough to allow central axis PDD and profile measurements to a depth of 40 cm. There are several variations of two-dimensional and three-dimensional (3D) water phantoms. Water tanks that are not large enough to permit at least a 40×40 cm^2 field and a scanning depth of 40 cm should not be used since full scatter condition will be compromised with possible errors. Scanning systems for photon beams should allow scanning in both cross- and in-planes (x and y directions). Scanning in both dimensions provides convenience and avoids alignment problems associated with tank rotation. For some TPS, data are required only for fields defined by the primary jaws, and the MLC is modeled in the TPS. However, measurements for MLC shaped fields are still needed for verification of the models.

If water is stored in a reservoir and pumped into the scanning tank, care must be taken to use distilled water with the addition of biocidal chemicals to prevent growth of algae that interferes with the driving mechanism. If a storage tank is not available, it is recommended that the temperature of the tap water be monitored when filling the tank and the temperature of the water in the tank should be at room temperature before starting measurements. Thermal response for some chambers are not fully accounted for, and hence, it is advisable to maintain the temperature very close to the room temperature.[27] Thus, it may be necessary to let the water sit for a period of time to equilibrate with the room temperature.

Since beam scanning usually takes more than several days, it is not uncommon to have algae buildup in the water after a few days of scanning. This is indicated by a change in

TABLE II. Physical characteristics of commerically avialable water equivalent materilas. NA: Nuclear Associates, NY; Radiation Product Design, Albertsville, MN; RMI. Radiation Measurements, Inc., Middleton, WI; CIRS: Computerized Imaging Reference Systems, Inc. Norfolk, VA.

			$(\mu_{en}/\rho)^{water}_{med}$			
Material, manufacturer	Color	Density (kg/m^3)	6 MV	10 MV	15 MV	18 MV
Polystyrene, NA, RPD	Opaque	1050	1.035	1.037	1.049	1.059
Acrylic/PMMA, RPD	Clear	1185	1.031	1.033	1.040	1.044
Solid water, RMI	Maroon	1030	1.032	1.039	1.049	1.052
Plastic water, CIRS	Lavender	1012	1.032	1.031	1.030	1.030
White water-RW-3, NA	White	1045	1.035	1.036	1.049	1.056

appearance of the water in the tank, from clear to a somewhat murky looking. An effective way to remove the algae from the water is to add a very small amount of laundry detergent or chlorine. This should be done before scanning or as soon as the water appears to be murky. An additional advantage of detergent in water is to reduce the surface tension to help visualize the exact position of the detector during setup. Most scanning system manufactures also provide chemicals to add to the water to safeguard the hardware.

Additionally, evaporation of the tank water is common over the course of the scanning. Depending on the size of the tank, evaporation can sometimes lead to a measurable change in detector depth. It is recommended that the water surface be verified periodically, especially during long periods of scanning. Upon completion of beam scanning, the tank should be completely drained and dried. In some cases, a small amount of oil should be kept on the scanning hardware. It is advisable especially not to leave tap water in the scanning tank for a long period of time after scanning as mineral deposits and algae growth can damage the scanning mechanisms and may void the warranty of the scanning system.

II.B. Dimension of phantom

The size of the water tank should be large enough to allow scanning of beam profiles up to the largest field size required (e.g., for photon beams, 40×40 cm^2 with sufficient lateral buildup (5 cm) and overscan distance. Some planning systems require larger lateral scans and diagonal profiles for the largest field size and at a depth of 40 cm for modeling. To determine the appropriate size of the scanning tank, the overscan and the beam divergence at 40 cm depth should be considered. A factor of 1.6 times the maximum field size should provide a safe limit. Simple calculation shows that a tank size of 75×75 cm^2 is an optimum recommended size. If the scanning software does not have the ability to perform diagonal scans, the table pedestal should be rotated to acquire the desired data. In general, collimator rotation does not provide the flattening filter information that diagonal profiles are intended to provide, and hence, such data should not be taken with collimator rotation.

For diagonal profiles, the size of the tank could be much larger than 75×75 cm^2 with the same overscan distance. In practical terms, however, very few commercial scanning systems are capable of scanning the full diagonal plus 5 cm overscan at depths of >30 cm for a 40×40 cm^2 field at 100 cm SSD. Some compromise could be made by taking only half scans. Consequently, half scans will have to be collected for maximum field sizes that require an offset of the tank relative to the central axis. Before setting up for half scans, it is important to verify that the open beam show minimal asymmetry ($<0.5\%$) so that a half beam profile may be mirrored to represent the entire beam. It is also advisable that the half field scan be extended at least 5 cm past the central axis on the short side so that there is sufficient lateral buildup for the central axis at deeper depths. Half-field scans require more setup time. Some data maneuvering may also be required to generate a complete set of scans, depending on planning system requirements. Whatever time-saving procedure is used to cover the area of interest, make sure that it is compatible with the system using the data as input.

II.C. Solid phantom

Point dose and nonscanned (integrated) measurements, such as output factors, surface dose, leakage/transmission, wedge and tray factors, etc., can be measured in a water phantom, and can often be performed with the scanning system. However, solid phantoms that mimic water may be used for convenience. Other plastic material such as acrylic or polystyrene should be used with caution, as data collected with these materials may result in values that may require additional corrections due to differences in electron density, stopping power (S) and energy absorption coefficient (μ_{en}/ρ) as noted in Table II and various references.[28,29] Tello *et al.*[29] showed that radiologically solid phantoms differ from water in electron and photon beams depending upon beam energy. It was pointed out that solid phantoms do not truly represent the radiological properties of water.

A solid phantom should have an appropriate cavity drilled for tight fit of the detector which should be verified with a radiograph taken with low kVp with the detector inserted in the phantom. Different slabs of phantom should be used for different designs of the detector to ensure that a tight fit is maintained for each detector. When detectors are placed in a solid phantom, enough time should be given to thermally equilibrate with the temperature in the cavity.[30] The quality of the phantom material should be checked with a computed

tomography (CT) scan for any artifacts and inhomogeneity in electron density via CT number. Note that these CT numbers may differ from water if the solid materials are designed to be water equivalent at megavoltage energies only.

II.D. Buildup cap

For the in-air collimator or head scatter factor (S_c) measurement, a buildup cap, and/or a miniphantom is traditionally used. Commercially available buildup caps (Radiation Products Design, Albertville, MN)[230] are inadequate to remove contaminant electrons at the energies for which they are rated. TG-74 (Ref. 20) recommends a miniphantom to provide electronic equilibrium and elimination of contaminant electrons provided that the field covers the miniphantom completely. For small field sizes ($\leq 4 \times 4$ cm^2), extended distance (e.g., source-chamber distance 300 cm) can be employed if one has to use the same water-equivalent miniphantom. TG-74 recommends that a preferable solution is to use a high-Z miniphantom and all S_c measurements be made at the same distance. Thus, a metallic miniphantom can be used at the isocenter because of its much smaller size[31] provided appropriate correction factors are applied as recommended by TG74.[20] Typical longitudinal thickness of a miniphantom is 10 g/cm^2, although other thicknesses can be used as long as a correction factor is applied.[32] A detailed description and recommendation can be found in TG-74.[20] It is important to choose a buildup cap of sufficient thickness in S_c measurements, otherwise erroneous S_c data will be obtained. Further discussion on the fundamentals of the output factors can be found in Sec. IV C.

II.E. Detectors

II.E.1. Availability of detectors

Various manufacturers offer a wide range of radiation detectors including ion chambers, diodes, diamond detector, and other types. These detectors can be categorized in terms of their size as standard, mini- and microdetectors. Even though there is no clear definition, ionization chambers could be divided by their active volume as indicated below:

- Standard chamber ($\approx 10^{-1}$ cm^3)—The active volume for a standard Farmer-type ionization chamber is on average 0.6 cm^3.
- Minichamber ($\approx 10^{-2}$ cm^3)—The active volume for a mini-ionization chamber is on average 0.05 cm^3.
- Microchamber ($\approx 10^{-3}$ cm^3)—The active volume for a microionization chamber is on average 0.007 cm^3 and ideally suited for small field dosimetry such as radiosurgery, gamma knife, CyberKnife, and IMRT.

II.E.2. Detector types

II.E.2.a. Ion chambers. Ionization chambers have been used since the discovery of radiation and are still widely used due to their small variation in response to energy, dose, dose rate, and reproducibility. Since chambers can be calibrated against a national standard, they can provide a direct measure of the dose. Ion chambers are relatively inexpensive, readily available, and are manufactured in various shapes (cylindrical, spherical, and parallel plate) and sizes (standard, mini, and micro). Humphries and Purdy[33] provided a list of chambers and their characteristics for beam data scanning. However, most vendors are now marketing different ion chambers for a variety of applications in radiation dosimetry. An assortment of radiation detectors for specific tasks can be acquired from various manufacturers (i.e., PTW, BEST, IBA, Standard Imaging, etc.) based on the latest research and need.

II.E.2.b. Diodes. Semiconductor diode detectors are used widely for beam data commissioning for both photon and electron beams. Characteristics of diodes include quick response time (microseconds compared to milliseconds of an ion chamber), excellent spatial resolution, absence of external bias, and high sensitivity. In addition, diodes provide energy independence of mass collision stopping power ratios (between silicon and water for clinically usable electron beams with energy between 4 and 20 MeV).[34–36] Thus, diodes are particularly attractive for radiation dosimetry in an electron beam. It is important that specific types of diodes should be used for specific radiation and hence electron diodes should only be used in electron beam and photon diodes should be only used in photon beam. The response of the diode detectors depends on temperature, dose rate (SSD or wedge), energy,[34,36–38] and some may have angular dependence as well. In order to achieve the required accuracy recommended by TG-62 (Ref. 39), either these effects should be corrected or a diode with minimum dose rate and energy dependence should be used. There are conflicting publications on the use of diode detectors for beam data acquisition,[40–43] hence, before using a diode detector, one should compare it with ion chamber measurements to confirm its correct operation and accuracy in data.

II.E.2.c. Detector arrays. A detector array system can be used for simultaneous data acquisition over the entire open beam and offers the most suitable method for soft wedge (dynamic wedge or virtual wedge) profile measurements. The array system may be an ion chamber array (air or liquid-filled) or a diode array, depending on the manufacturer. Since an array consists of several detectors arranged in a linear fashion, the array must be calibrated in a field size recommended by the manufacturer to set the amplifier gain of each detector before it can be used for the scanning. Often these detectors are calibrated from the factory with proper gain; however, it should be checked for accuracy before use. It has been noted that there is no difference between diode and ion chamber array for dynamic wedge data measurement, and hence, either of these systems could be used.[44,45]

II.E.2.d. Diamond detector. Diamond detectors are a solid-state radiation detector with a high electron and positive hole mobility making them attractive semiconductor detector for ionizing radiation. The theory of diamond detectors is very similar to that of diode detectors. When ionizing radiation is absorbed, it induces a temporary change in the electrical conductivity of the material.[46–50] The response of a diamond detector is directly proportional to the absorbed dose rate. Diamond detectors do not exhibit any directional

dependence and they are tissue equivalent. The sensitive volume is small (1.0–6.0 mm^3), which makes it ideal for small field dosimetry and for profile measurements. Diamond detectors do exhibit a small dependence on dose rate. They can be used in water with any scanning system for data commissioning. The diamond detectors are difficult to manufacture and hence are more expensive than other solid state detectors.

II.E.2.e. Thermoluminescent dosimetry. Thermoluminescent dosimetry[51] (TLD) has been used for point dose measurements and *in vivo* dosimetry. The TLD material comes in several different forms, such as rods, chips, and powder. Rods and chips are reusable once they have been properly annealed. TLD exhibits strong energy dependence, fading, and nonlinear dose response. However, these effects in megavoltage beams are relatively small.[52,53] The accuracy is limited to the irradiation and measuring techniques. Typically an accuracy of less than ±5% (Ref. 54) can be achieved. For the Radiological Physics Center and calibration laboratories, accuracy on the order of ±1% is achievable. TLD is usually not suitable for data commissioning except for verification and cross reference of point dose in small fields and IMRT.

II.E.2.f. Film. Film is used for dose measurement based on optical density variation that is generally dependent on field size, depth, beam energy, processor condition, and other factors as described in TG-69.[21] There are two types of films; silver halide and Gafchromic. TG-69 and TG-55 (Ref. 55) provide overviews of silver halides films, and Gafchromic films, respectively. Silver halide films exhibit strong energy dependence for photon beams but their response is relatively independent in megavoltage electron beams. Due to this reason film could be used for electron beam.[22,56] Beam data acquired with films may not be as accurate as data acquired with ion chambers. However, film does provide an opportunity for acquiring planar dose maps in small fields[57,58] and for soft wedges.[59] When film is used for small field dosimetry, blurring due to film scanner should be considered as observed by Yin.[60]

II.E.2.g. Metal–oxide–silicon–semiconductor field effect transistor (MOSFET). MOSFET dosimeters have been investigated for their use in clinical dosimetry[61] and IMRT verification.[62] Due to their small size, MOSFETs are ideal for small field dosimetry, brachytherapy, and *in vivo* dosimetry. MOSFET dosimeters are similar to conventional dosimeters in reproducibility, linearity, energy, and angular responses.[61] The MOSFET detectors have a short life span (total dose) and are not suitable for beam commissioning but can be used for specialized point dose measurements.

II.E.2.h. Bang gels. Bang gel detectors[63] are tissue equivalent and provide a 3D dose map with high spatial resolution. They are energy independent over a wide range of energies, making them ideal for measuring three-dimensional dose distributions. In order to generate an image of the dose distributions, the gel needs to be imaged by using magnetic resonance imaging, x-ray computed tomography, or optical computer tomography. Each of these imaging techniques is susceptible to imaging artifacts. In general, the use of gels is an extensive process and has limited usefulness in beam data commissioning except for SRS and IMRT.

II.E.3. Selection of detectors

Ion chambers, diodes, and diamonds are well suited for commissioning beam data in a scanning water phantom. Ion chambers are by far the most commonly used due to their availability, the relatively low cost, accuracy, and ease of application. The selection of detectors should be carefully examined with the type of application, field size, resolution, and time needed to complete the data collection. For example, most scanning systems utilize ion chambers with an inner diameter of 4–6 mm, which is adequate for field sizes $\geq 4 \times 4$ cm^2. However, these chambers are not appropriate for the small field data required for IMRT and cannot describe correctly the penumbra region due to blurring. Rather small volume ion chambers or diodes are often used for small fields $\leq 4 \times 4$ cm^2.[64–68] Small volume chambers and diodes tend to have different characteristics for large fields compared to small field and should not be used for all field sizes unless it can be documented that accurate data can be acquired for all field sizes. Small field profiles should be measured with microchambers such as stereotactic field diodes or pinpoint ion chambers. Since signal in these detectors are relatively small, scanning (sampling) time should be increased to improve the signal-to-noise ratio as discussed in Sec. III A 3 g.

II.E.4. Detector response and corrections

The finite size of the detector provides an average response over the sensitive volume that smears the profiles. When small volume detectors are not available, a deconvolution method[69–76] could be used. It has been proven definitively that the broadening of the measured penumbra due to the detector size could be explained by the detector convolution kernel.[70–76] It is possible to extrapolate the true penumbra using the detector convolution kernel. Deconvolution algorithms are susceptible to noise and require tuning to eliminate the noise effect.[72] This problem could be solved if both the penumbra and detector convolution kernel are expressed as analytical functions. Several studies have provided analytical expressions for the penumbra[77,78] and the detector convolution kernel. To avoid such a lengthy process, user should choose a microchamber for small field measurement. The deconvolution method is complex and time consuming to be effective for a large number of profiles and should be reserved as a last choice for only a limited data set unless a commercial software is available.

III. SCANNING SYSTEM SETUP

Setting up the water phantom system properly can help improve the workflow, and more importantly, reduce the likelihood of collecting suboptimal data, which may result in a considerable amount of processing and sometimes may even require rescanning. Before setting up the water phantom and planning for data collection, check the existing

cable run. If existing cable runs cannot be used, it is necessary to run cables under or over the door. It is also beneficial to set up the scanning computer alongside the accelerator controls to reduce the unnecessary movement across the control area. This can trim considerable time from the total data collection time.

III.A. Verification and validation of scanner

Modern water scanning systems are extremely accurate and precise. However, some basic quality assurance as suggested by Mellenberg *et al.*[79] and Humphries and Purdy[33] should be adopted. A periodic quality assurance or at least before the use of the water tank may be warranted to check the free movement of each arm, and the x,y,z, and diagonal motion. Manufacturers of scanning systems offer annual preventive maintenance services that should be performed. Accuracy and linearity should be checked over the long range of the scanning system. Physical condition of the tank, such as leaks, cracks, and mechanical stability, as well as the quality of connecting cables for leakage and reproducibility should also be checked before the use of scanning system for commissioning beam data.[33]

When using a scanning system where all components are manufactured by the same vendor, it can generally be assumed that these components are matched to provide good data; however, the user should still verify that there are no defects or communication errors in any of the components. Furthermore, it is possible to add components, particularly detectors, from the same vendor and those components may not be compatible with the original scanning system. In house controllers to link scanner with accelerators to provide automated field change and batch job as described by Schmid and Morris[80] should be tested for flawless operation. Such futuristic interface devices are not yet available from commercial vendors.

There has been an increase in detector specialization. This may require the user to connect new accessories (detectors, cables, connector, adaptors) to an existing scanning system. The resulting scanning system may be a collection of components from different manufacturers and it is incumbent upon the user to verify the integrity of the hybrid system. Detector attachments typically require a proper attachment kit for a specific scanning system.

III.A.1. Scanning (field) and reference detectors

In general, two detectors are needed for scanning; a field or scanning detector that moves in the tank as programmed and a reference detector, which is stationary in the field. The use of a reference detector is strongly recommended for all scanning systems. This removes the instantaneous fluctuations or drifts in the incident beam output. Both the scanning detector and the reference detector must be securely mounted with custom or vendor specific holders in order to produce accurate and reproducible scans. Metallic adapters and holders should be avoided for securing the detector in the scanning system, as scatter radiation could affect the data accuracy. When using a detector, which was not originally supplied with the scanner, an appropriate adapter should be used from the manufacturer of the new detector. Do not attempt to tape or shim the detector into position since submersion into water may loosen such mounts and produce inconsistent data increasing the time for commissioning.

The reference detector may be positioned anywhere in the beam where it does not shadow the field detector for the entire area of programmed positions. For very small fields, where the reference detector may shadow the field detector, a time integration method could be used instead of the reference chamber. The field and reference detectors should be chosen based on the application of the beam data, as discussed earlier in this document. These two detectors do not have to be of the same type. However, when connecting these detectors to the scanner, the following parameters should be considered carefully.

III.A.1.a. Detector mounts. Generally, the detectors supplied with scanning systems have nearly identical dimension in active length and inner diameter. However, if this is not the case, consideration should be given to chamber dimension when determining scan directions. Apart from the dimension, the movement of the detector should be considered. With respect to the central axis of the beam, long axis of the detector could be mounted in three possible ways: (i) perpendicular but in gun-target direction, (ii) perpendicular but in cross-plane, and (iii) parallel to the beam. Detector orientation plays an important role in profiles and penumbra measurements, which will be discussed in Sec. IV A 4 a. Detector should be mounted such that the scanning arm has minimum volume in the scan direction. When parallel orientation is used, care should be taken for leakage and cameral effect as discussed in Sec. III D 4.

III.A.1.b. High voltage (bias). Most ion chambers are operated in the voltage range of 300–400 V. On the other hand, diodes must have zero bias. The diamond detector typically uses 100 V. It is recommended that before connecting the detector to the electrometer, the user should be familiar with the type and voltage requirement of the detector. It is a good practice to check the bias requirement while changing detectors in between data collection and before turning the electrometer to the ON position. Incorrect application of detector bias may damage the detector. Figure 2 shows PDD data collected with a chamber with excessive leakage (bad chamber) and a correctly functioning chamber (good chamber) with an incorrect and correct gain setting. An appearance of abnormal pattern or spikes observed in the scan data could be an indicator of improper detector bias and or gain. In such situation the scanning should be interrupted immediately and the detector bias should be checked properly.

III.A.1.c. Polarity. The polarity of an ion chamber signal is determined by the high voltage (HV) bias polarity and will not be an issue if the HV bias is controlled by the electrometer. However, diode signal polarity is determined by its internal construction. The diode manufacturer may offer both positive and negative polarity for the same model detector. Therefore, the user must ascertain when ordering the detector that the electrometer can accommodate the polarity. In general, most detectors can be operated with either polarity,

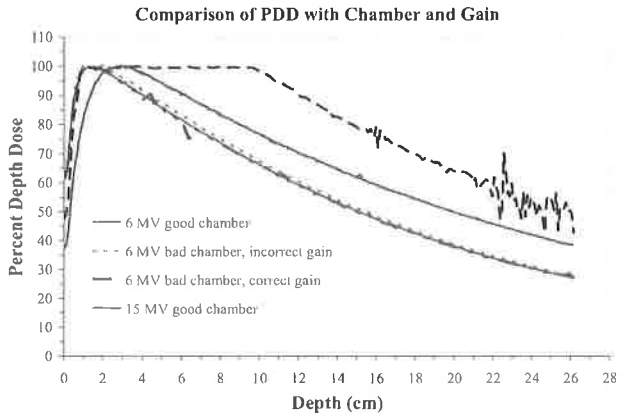

FIG. 2. Comparison of depth doses with good and bad chambers with correct and incorrect bias.

however, the user should make sure that data collected in the positive (+) polarity is in agreement with the negative (−) polarity. Figure 3 shows the ratio of PDD taken with positive and negative (±) polarity for various detectors. The line at 1.0 corresponds to no polarity effect and either polarity can be used. Large deviations could be observed for some detectors in Fig. 3. Kim *et al.*[81] provided the magnitude of polarity effect in thimble ion chamber at low dose rate that also needs to be clearly evaluated. In general, some differences with ± polarity are expected. However, the difference should be less than 0.5%. It is recommended that data collection be performed at a consistent single polarity that is reproducible in repeated measurements. Differences, as noted in Fig. 3, can be avoided by selecting one polarity for the entire scanning and choosing an appropriate detector that has minimum polarity effect.

III.A.1.d. Recombination. Ion recombination is generally not a problem in most ion chambers that are designed specifically for scanning at relatively high (≤300 V) voltages. Check the manufacturers' recommended bias settings for the scanning chamber. Some small volume chambers may have a lower recommended voltage bias than the standard 300 V. If possible, set the bias at half voltage and check the recombination effect[82] at the dose rates used during scanning to verify that no recombination correction is needed.

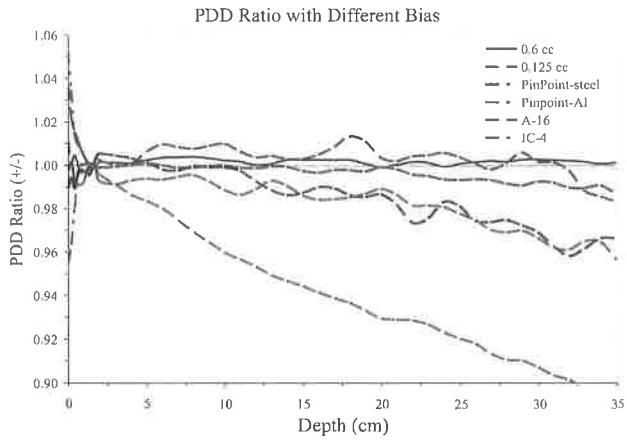

FIG. 3. Ratio of depth doses with positive and negative (±) polarity on various chambers.

III.A.1.e. Sensitivity. The sensitivity of the detector must be sufficient to provide a reasonable signal-to-noise ratio in the electrometer but not as high as to cause signal saturation. The measurement range of the electrometer should be checked before scanning. The sensitivity of the detector should be available from the detector manufacturer. The sensitivity of the field and reference detectors should also be balanced. Some scanning software packages adjust the gain automatically in both the field and reference electrometers to equalize the signal. It is a good practice to check the gain of both detectors when field size is changed. Of course, the gains may need adjustment when scanning is switched from open to wedged fields.

III.A.1.f. Energy response. In general, ion chambers have an almost constant energy response for megavoltage photon beams and can be used without corrections. Diode detectors, on the other hand, may have an energy response in photon beam that may affect the scanned data. The diode energy response can be detected by comparing its PDD for 6 MV in a large (40×40 cm^2) field with the corresponding ion chamber measurement. If the diode curve does not drop off as rapidly as the ion chamber PDD, then this is an indication of energy response. Generally, diodes should not be used for PDD measurements in large x-ray fields, unless specific compensation or corrections with validated test results indicate otherwise.

III.A.2. Cables, connectors, and adapters

The integrity of scan data requires a high quality cable and electrometer; otherwise, the detector signal can be influenced by many subtle factors that will lead to incorrect beam data. Some of these factors are related to the fidelity of the cable, quality of connections, and adapters. Users should be aware of various types of connectors, which are discussed below.

III.A.2.a. BNC and TNC connectors. The BNC (Bayonet Neill-Concelman) is named after its inventor and has a twist-on attachment, like a bayonet. It is made for both coaxial and triaxial cables. TNC (Threaded Neill-Concelman) is a threaded version of the BNC connector. Both of these connectors are used in dosimetry and some familiarization is important. Figure 4 shows examples of these connectors. The BNC and TNC connectors look alike from outside. Connectors come in various types (TNC, BNC, etc.), sexes (male, female), and conductors (triaxial, coaxial). The examples in parenthesis are most common among radiation detectors and electrometers used in water tanks. One vendor has a modification of a "triax" connector, which appears as a coaxial and an electrical pin inside the connector housing. Details of these connectors can also be acquired from various vendors such as CNMC, Standard Imaging, PTW, and Wellhöfer. It is always helpful to mark these connectors when they arrive from vendors for future use.

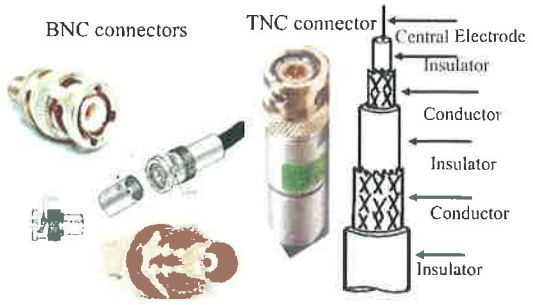

FIG. 4. BNC, TNC, and components of the triaxial cable.

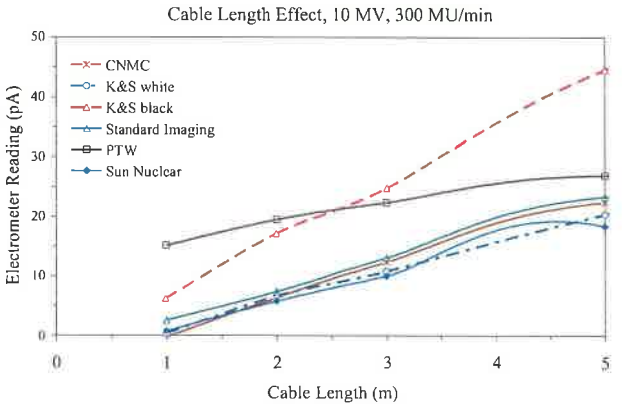

FIG. 5. Effect of cable length in radiation beam. The cables are of different types from various manufacturers.

- Male: Center conductor is a pin
- Female: Center conductor is a socket hole
- Triax: Three-conductor cable or connector, all concentric
- Coax: Two-conductor cable or connector, all concentric
- Adapter: A connector union or short cable with two ends that connect to different connector types.

III.A.2.b. Common connection errors. Most cables used in radiation dosimetry and with the scanning system have triaxial adapter ends with male and female connections. Ion chambers are directly connected to the triaxial cable end. Some manufacturers market unusual looking triaxial ends (nonstandard) that may not fit standard ion chambers. If such a situation is noticed, special adapters from manufacturer should be acquired. PTW is one such vendor that has different triaxial adapter ends. With a diode, there are two electrodes (anode and cathode) and these require a coaxial cable. Ion chamber connectors have three electrodes (collector, guard, HV bias) that require a triaxial cable. It is possible, with proper adapters, to use a triaxial cable with a diode detector, but the reverse is not applicable, i.e., a coaxial cable cannot be used with an ion chamber. Furthermore, since there is high voltage in the ion chamber cables, care must be taken that there is no shock hazard to personnel or to sensitive electronic equipment. It is imperative that every connection be made only with the equipment powered off.

Forcing a coax BNC connector into a triax BNC connector is the most common error when trying to connect a diode detector into an electrometer designed for ion chambers. Two serious problems can happen: (1) damage to the connector by forcing the coax and triax together, and (2) the electrometer's high voltage bias supply is shorted with improper connection that may damage the detector or electrometer. Do not force, twist, or turn the cable as that may short the bias when connecting. Even with inaccurate connection one may still see some signal. However, such signals are nonreproducible.

III.A.2.c. Leakage current. Every cable used in data collection has a certain amount of leakage current that depends on the quality, upkeep, and handling of the cable. Heavily twisted and badly bent cables may result in significant cable noise. Most commercially available cables have a leakage level in the range of 10^{-13}–10^{-14} A.[83–85] The leakage is significantly higher for poorly kept, twisted, and kinked cables. When data are collected in small fields or beyond the field edge, the leakage signal can overwhelm the measurement signal. Leakage noise current is typically dependent on the quality of the cable, length of the cable in the beam, and connectors. Some electrometers have leakage, zero, or null circuit options, to offset any leakage. If such option is available, it should be used to offset the leakage signal with beam off. The orientation of the detector mount also affects the amount of cable in the beam which may introduce a leakage signal.

Figure 5 shows the effect of cable length in the radiation beam for various types of cables from different manufacturers. The amount of cable in the beam could be a serious matter in electron beam which was discussed by Das *et al.*[86] Special precaution is needed when large amount of cable is kept in the radiation beam. Prior to scanning, one should inspect the cable length for kinks and nicks in the jacket, particularly the length near the detector where it will be submerged. A sharp kink and nick can cause discontinuity as well as damage the inner dielectric insulator and the noise reduction coating, which may cause electrical problems in the electrometer when submerged.

III.A.3. Electrometers

Electrometers used with a water scanning system have a high degree of fidelity with a wide dynamic range. They can measure charges in the range of 10^{-6}–10^{-14} C. Electrometers should be reset to null or zero before scanning. The user should verify that the response is linear before measuring any data in various gain range settings. A collected reading is a composite response of the detector and electrometer. The detector response is typically microseconds (μs), whereas electrometers are millisecond (ms), hence, electrometer response is much critical in scanning.

III.A.3.a. Measurement polarity. There are two types of input polarity to an electrometer: bipolar and unipolar. Bipolar electrometers can measure input signals of both positive and negative polarity. Unipolar input can only measure input signal with one polarity. See the discussions above on polarity and leakage.

III.A.3.b. Input offset current (leakage). In addition to the signal current, an offset (leakage) current contributes to the measurement signal. In most systems, this should be an insignificant contribution. However, it may become significant and cause offsets in the profile measurement especially with insensitive and small volume detectors as discussed above on leakage current.

III.A.3.c. Input offset voltage. Electrometers also have an input offset voltage between the inverting and noninverting inputs. The electrometer's basic operating principle maintains these two inputs at (or near) the same voltage. If this offset voltage is significant, for example greater than 1 mV, then different effects can occur. With an ion chamber, there will be an offset in the signal measurement, much like the effect of input offset current. If measuring with a scanning diode, this offset voltage is directly across the diode and will cause current to flow, just as if it were coming from the diode signal.

III.A.3.d. Continuity. Another issue with small dimension chambers is reasonably good ion collection with a low voltage bias. Even voltages as low as a few millivolts can provide reasonable (but not saturated) ion collection. These are the types of voltages present at the electrometer input offset between guard and electrode. If an HV bias is failing or if there is not good contact to the chamber HV electrode, one may still collect what appears to be a good signal. Apart from invasive testing, there is limited testing to assure good continuity. One method, if the electrometer and bias control permit, is to change the polarity, when collecting beam data, to see if the signal polarity changes as well. If so, then the change in signal polarity is likely due to the bias change because the stray contact and input voltage offsets will generally not change with the bias polarity switch.

Another problem with continuity could occur when the scanning chamber and cable are submerged in the water tank. If proper care is not taken in the connections, adapters, cables, etc., a "short" of the bias supply to the chamber could occur under the right conditions. Comparison of scans in the dry run and water run tests described below could show a difference. In addition, the polarity reversal test in the above paragraph would also show a problem.

III.A.3.e. Gain and autorange change. Electrometers may have different gains that allow the use of a variety of scanning detector sensitivities. The gain can be adjusted either manually or automatically. If it is a manual system, the gain should be checked for both field and reference chambers such that they produce nearly identical readings at a reference point.

III.A.3.f. Signal saturation. Use of a scanning detector that is not included with the original design of the scanning system may cause the electrometer to over-range. Some of the small volume ion chambers have sensitivities of 0.5 nC/Gy, whereas some diodes could have sensitivities of 50 nC/Gy or more. This is a difference of a factor of 100. Thus, measuring with a diode on an electrometer setup for small ion chambers may easily saturate the electrometer. Any abnormal scan should be analyzed in the context of signal saturation. Such a scenario often happens in wedge profiles where signal range varies significantly from toe to heel of the wedges.

III.A.3.g. Signal-to-noise ratio. The opposite of signal saturation is "not enough signal" above the noise level, i.e., low signal-to-noise ratio. The signal-to-noise ratio should be kept high by choosing proper detector, gain, and good quality of cables with minimum noise. If scanned data are not smooth, especially in the penumbra region for photon beam and bremsstrahlung tail for electron beam, one should look into the signal-to-noise ratio. A factor of at least 100 for a signal-to-noise ratio is a good criterion that should be maintained for scanning.

III.A.3.h. Response time. The response time of the electrometers determines how quickly the changing signal is tracked and measured. The signal from the scanning detector changes very quickly at the beam edge with high speed of scanning. If the response time is too long and the scan speed is fast, this will result in penumbra broadening. It is difficult to generalize and provide numerical values since scanning systems use different approaches and varied response time. Modern scanning systems have speed from 1 to 500 mm/s and typical response time of $\leq$10 ms. Hence, a high speed up to 100 mm/s may not be a problem.

III.B. Scanning water tank

III.B.1. Positioning and labeling

Positioning and labeling the tank appropriately is critical for ensuring the quality of data and/or detecting possible sources of error in scan data. The scanning tanks should never be placed on the machine treatment table as the water load could easily damage the table support mechanism. A typical large scanning tank with water weighs nearly 280 kg (616 lbs), which is well beyond the weight tolerance of the treatment tables. Most manufacturers provide a sturdy platform either over a water reservoir or stand-alone platform to support the tank. When setting up the tank, the orientation should be such that the chamber can scan with the least amount of moving parts. For example, on many 3D systems, the x scan dimension requires only the chamber to move along a scanning arm, whereas the y scan dimension requires the entire arm to move in the water. The x scan may give cleaner scans since less material is passing through the water, disturbing the water surface less. Position the tank based on the desired conventions of the scan and treatment planning nomenclature. Disturbing and transposing scanning tank labeling during commissioning is not recommended as it adds extra time and may confuse the machine parameters.

The tank origin (0,0,0) should be close to the machine isocenter. Otherwise, the offset could pose problems for large field measurements. A good practice is to align the tank with the lasers such that x axis is the cross-plane (left-right) and y axis is the in-plane (gun-target) direction. Differences about $\pm 1\%$ in x and y profiles could be expected and tolerated for most machines. For some linear accelerators like Siemens where beam steering is only available in the radial direction, x scans are smoother and less problematic. It is recom-

mended that manufacturer-supplied alignment devices should be used when available. Most scanners have a built-in labeling system, i.e., x, y, and z. It is advisable and expected that labeling is consistent with the TPS.

III.B.2. Scanner movement

Make sure the detector is level with the water surface in all four corners of the tank. If a vendor-provided alignment cross mark on the cap is available to check the horizontal level in all four corners of the tank, it should be used as it provides precise leveling of the tank. One can also use a mark on the detector or any other device to check the leveling.

III.B.2.a. Central axis scanner movement. The z-direction movement of the detector should be parallel and should follow the central axis of the machine at 0° gantry angle. One could verify the detector movement to follow central axis for depth dose by following methods:

- Check the vertical travel of the detector with a simple string plumb bob to make sure that the arm travel is exactly vertical.
- Close the jaws to a field size that gives about 1 mm flash on the sides of the detector and one jaw in the other direction gives about 1 mm flash on the end of the detector. Then by driving the detector from surface to depth, one can follow not only the location of the crosshair image on the probe, but also the relationship of the detector to the jaws. It is quite apparent if the probe "walks" when going from surface to depth.

If performing tests on the tank prior to each use, the above tests should be carried out with the tank full, as this influences leveling of the tank.

III.B.2.b. Zero depth. In setting the SSD, the distance should be verified by at least two methods, such as laser position on the sides of the tank and the ODI and/or a mechanical measuring stick. It is very convenient if the laser could be used as distance indicator. This would require the accuracy of the laser be verified. When the water surface is properly aligned with laser/mechanical pointer for 100 cm, the detector position should be set such that the center of the detector splits the water surface. This is easily done with a cylindrical chamber, when looking underneath at the reflection of the detector onto the surface of the water. The proper way to ensure that the center of the chamber is set precisely at the water surface is illustrated in Fig. 6 for the cylindrical chamber where the reflected image and the detector make a perfect circle. This position should be denoted as the zero position and should be set in the computer for scanning purpose. Water evaporation may cause a change in zero depth and should be checked at the beginning of the day and periodically (at least every 6 h) during the day. Some scanners have motors that displace water when they are immersed during scanning. The scanning software usually corrects for the change in depth based on the displacement. However, for a large tank such errors are relatively small. For these types of scanning system, operational instructions should be carefully followed and software compensation needs to be verified before use.

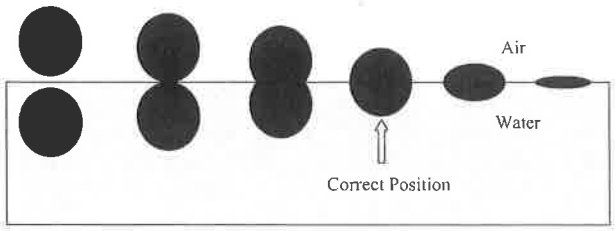

FIG. 6. Sequential appearance of chamber and its reflection in water viewed from tank side. The correct position is when both images form a perfect circle.

III.B.2.c. Chamber shift. With the tank and/or scanning arms leveled and the water surface at the correct SSD, the origin on the scanning system can be established. For some protocols, the center of the detector is not the point of measurements, and hence, the shift to an effective point of measurement is needed. The shift for photons is different from that of electrons and also different for different dosimetry protocols.[82,87,88] When a cylindrical ion chamber is used in a water phantom, the geometrical center can be accurately determined as shown in Fig. 6. The ion chamber shift can be made from this initial position. Many scanning systems will account for this offset in the software, and/or an option of performing a manual offset (turning software correction off) is provided. If the scanning software is used to correct for the offset, the depths associated with the measured data may be noninteger values. For most ion chambers, this offset is typically between 1.5 and 2 mm, and hence, the chamber should be lowered by the shift amount from the zero position. This will be then the correct position for scanning.

III.B.3. Orientation

Most scanning systems have an orientation method to define the relationship between the tank position and gantry axes. Typically the y axis is the gun-target and the x axis is the cross-plane direction. Make sure that this orientation is correct and that the motions are correct. Improper orientation and definition of orientation can compromise the data when input into a treatment planning system. For example, if the TPS reads scan data as if a 45° wedge scan was performed from the end of table to the gantry with the toe of the wedge facing the gantry, but in fact, the scan was really performed along the nonwedged direction in the transverse plane, this would seriously compromise data entry.

III.B.3.a. Axis alignment. For correct scanning, the tank must be positioned so that it is aligned with the radial (in-plane) y axis and transverse (cross-plane) x axis. This can be accomplished by aligning lasers to the alignment marks on the side of tank or aligning the probe holder to a field edge. This can also be checked by manually driving the probe along one of the axes while ensuring the center of the probe does not "walk" from the crosshair. If this is not done correctly, the field size of the profiles will not be correct and

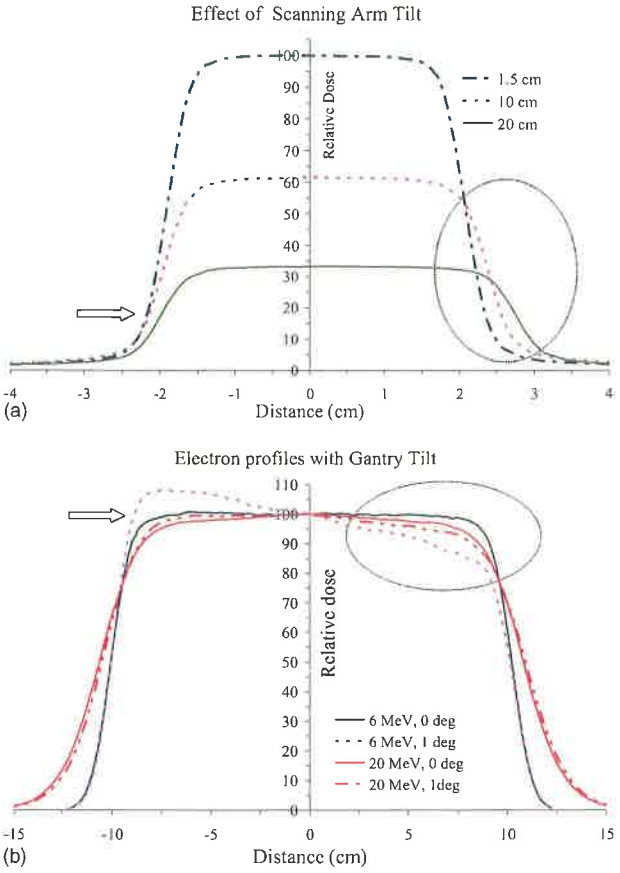

FIG. 7. (a) Beam profiles of a 6 MV beam at different depths with scanning arm tilt for a 4×4 cm^2 field, (b) electron beam profiles at depth of 80% depth dose for 20×20 cm^2 cone with gantry tilt. Arrows and circle are shown to represent the impact of arm and gantry tilt.

some profile data, such as wedge profiles, can be compromised. If photon and electron beam profiles do not look accurate, arm tilt and tank tilt may be responsible, as shown in Fig. 7, and corrective action should be taken.

III.B.3.b. Tank tilt. Leveling of scanning systems may involve leveling the entire tank or only the scanning arms using a precision level. For x rays, the effect of a tilt in the scanning arm will be a subtle change in symmetry, but a marked change in the centering of each individual scans, i.e., beam appears to become increasingly off center with increasing depth as shown in Fig. 7(a). This can become significant for small field and/or wedged fields, since PDD is not following the central axis but drifting off axis under a different part of the wedge. For electrons, the effect can be dramatic for profiles at depths past d_{max}, especially for low energy electrons in which the percent depth dose curve is steep for the descending portion of the curve. Figure 7(b) shows the effect of tilting of the scanning arm on electron profiles.

III.B.3.c. Gantry tilt. A tilt in the gantry during data collection can have an effect on cross-plane profiles and/or depth dose data. The effect may be subtle such that, the scans may appear to be off center at deeper depths (Fig. 8). It is essential that the gantry be leveled prior to data collection.

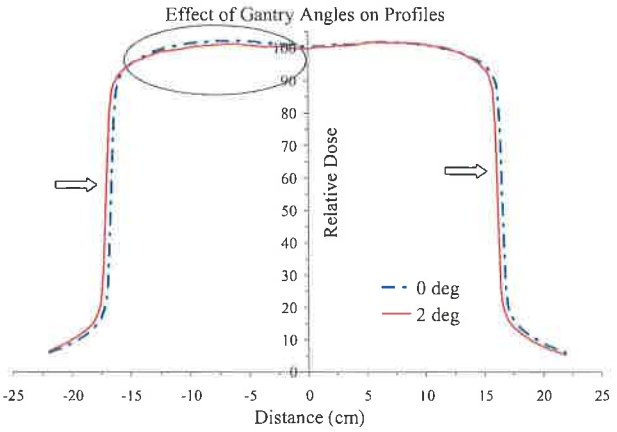

FIG. 8. Effect of gantry angle tilt on the profiles of a 6 MV beam for 30 $\times$30 cm^2 field at 10 cm depth.

The gantry angle should be checked with a precision level to avoid the appearance of asymmetry in the transverse scans.

III.C. Scan mechanism and movement

III.C.1. Array detector weight

In a water phantom system, the detector mount and scan mechanism are typically designed to support small, lightweight detectors. Some multidetector arrays may have a significant weight beyond the design of the scanning mount. Check with the scanner manufacturer before adapting a scanning system to use a detector array. Due to the size and weight of an array system, movement of the scanning arm should be checked before collecting data.

III.C.2. Speed and position accuracy

Depending on the detector signal strength, the sensitivity and/or sampling time of the scanning system electrometers, and the accuracy of positioning, there may be situations in which the scanning system cannot respond as fast as the scanning probe is moving. To test this, scan across 40 cm with a 20 cm field at the highest and lowest speed. Compare the two profiles for alignment. If the relative shape agrees but there is a shift, then there may be a limit as to how fast one can scan.

III.C.3. Hysteresis

A scanner should be tested for hysteresis in its position encoding. This is typically a problem with older scanning systems. They can be tested by scanning the same field at a moderate speed in one direction and then reverse the scanning direction. If these two profiles do not align and match perfectly, there is a hysteresis in the scanning movement. Such scanners should be sent to the scanning system manufacturer for repair and should not be used for scanning.

III.C.4. Corrosion

Follow the recommendations of the tank/scanner manufacturer on water additives, water storing, etc. Generally, it is

not advisable to let the scanning mechanism stay submerged when not in use for prolonged periods, especially overnight.

III.D. Premeasurement test

III.D.1. Dry run

The premeasurement tests should be performed for every new scanner before the first use of the tank before beam data commissioning. Also, it is essential to perform the test before an annual calibration which happens more often than the machine commissioning. After connecting all components but with no water in the tank, position the scanning detector at isocenter and the monitor detector at an appropriate position as to not to interfere with the scanning detector. A buildup cap may be used with the scanning detector. Perform an in-air scan of a 20×20 cm^2 field, allowing the scan to run from -20 to $+20$ cm (40 cm total). Make any necessary adjustments to the scanner's electrometer controls, as instructed in the manufacturer's user guide. A dry run may not work on some scanners that stop the scanning when there is no signal from the reference channel.

Repeat the scan; however, turn the beam off when the detector reaches the cross hairs. Save the scan and inspect the data either using the scanner's software or export it to a spreadsheet for analysis of the following items:

- Noise: In a flat region (slope of profile equals zero) of the profile, calculate the standard deviation. This is the standard deviation of the noise with the beam on.
- Signal-to-noise ratio: In the same region, calculate the coefficient of variation that is the standard deviation divided by the mean. This is closely related to the signal-to-noise ratio.
- Time constant: At the point where the beam turned off, examine the time it takes for the scan values to settle to the nonradiation value. This is related to the time constant (or response time) of the system, including any residual detector currents.
- Leakage: In the region after the nonradiation value settled to a flat value, calculate the mean and standard deviation of the nonradiation value.
- Electrometer offset: If there was no autorange changing of gain in the electrometer, the standard deviation in the nonirradiated area should be nearly equal to that calculated in the flat radiation region above. The mean value is the electrometer offset, which should be subtracted from all measurements (on the same gain).
- Polarity: If the electrometer is bipolar, there may be negative values and even a negative mean. This is normal and the subtraction of mean should preserve the sign, i.e., if a negative mean, then subtracting the negative value will actually add a positive value.
- Null value: If the nonradiation value (background) is zero and never changes, then it is possible that there is a suppressed zero in the data collection. This will result in a measurement error in penumbra and tail regions.

III.D.2. Water run

The cracks in the cable jacket or any leak in the detector may change the circuit parameters of the scanning device and possibly change the results when the tank is filled with water and the detector and cable is submerged. Do not submerge connectors unless they are known to be waterproof. After filling with water and submerging detector and cables, it is best to allow at least $\frac{1}{2}$ h or more to pass before proceeding with the test. Repeat the same tests as performed on the dry run and make sure that above parameters are nearly the same. The standard deviation of noise should not increase. Repeat the test again at the maximum scanning depth required. This will result in the lowest signal-to-noise ratio. This ratio should be greater than or equal to the known sensitivity of the system.

III.D.3. Saturation test

Repeat the above dry run procedure with an open 20×20 cm^2 field, at the maximum dose rate and a moderate dose rate. Compare the profiles.

III.D.4. Extracameral volume

Scanning detectors have a very small volume in the thimble where the ionization is measured. However, nonthimble area, connector, and cable irradiated either with scatter or primary radiation produce ionization contributing to the scan signal known as extracameral effect.[83,84,89] The extracameral volume is not constant since it does not originate within a chamber with good collection efficiency. After the saturation test, remove the scanning detector from its mount and place it on or near the electrometer. Start a scan and note the scanning detector response with and without beam on at the maximum dose rate. Any change in detector response is due to extracameral volume. It is assumed that the detector volume is significantly less than the extracameral volume. Compare this response with the signal from the tails of a profile measurement for its significance.

III.D.5. Energy response test

When performing PDD measurements with a diode, the energy response can be detected by comparing the measured PDD at 6 MV in a large (40×40 cm^2) field. Then repeat the measurement with a large volume scanning ion chamber. Compare the two PDD curves beyond d_{max}. If the diode curve does not drop off as rapidly as the ion chamber PDD, then this is an indication of energy response variations. The large volume chamber (e.g., 0.6 cm^3) scanning should not be affected by stem leakage, assuming the chamber passes all other tests.

III.E. Data acquisition

Data acquisition should be conducted in an organized fashion to avoid confusion. The order of scan acquisition on many scanning systems will greatly improve the ability to access the scan data later. In addition, the data should be acquired such that sets of data can be collected at the same

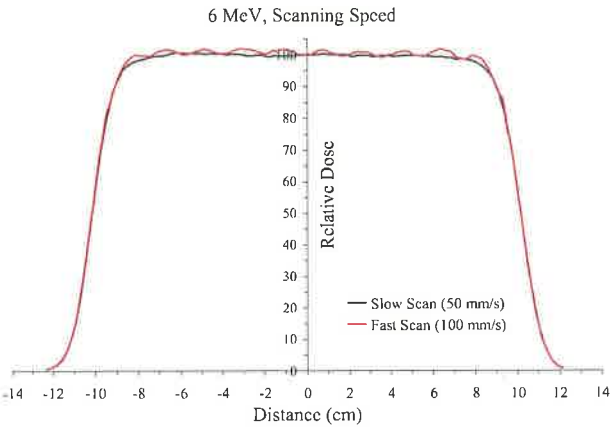

FIG. 9. Impact of scanning speed on the quality of electron profile.

time to improve the consistency and accuracy of beam data. Organization of the measurements needed with a spreadsheet as shown in Table I, will be helpful in expediting the data collection.

III.E.1. Scanning parameter protocol

Data collection has several components that depend on the software being used. However, one should utilize the features of the scanning software for optimum management and quality of data which depends on speed, time delay, and sampling time. As discussed in Sec. I B 4, a significant amount of time is needed to commission beam data. There is a tendency to reduce the overall scanning time, as noted in Eq. (1), by increasing scanning speed and sampling data coarsely. Speeding and undersampling produce suboptimal data especially for low energy electron beams. These will be discussed in their respective sections.

III.E.2. Speed

High scanning speed can result in noisy scans and/or ripples in the acquired data due to wave motion induced by the movement of the scanning arm. This is especially critical for profile acquisition at depths greater than d_{max} for low energy electrons. If the motion is too fast, the wave motion induced will cause the scanning probe to see a varying depth depending on whether at the peak or valley of the water wave. Figure 9 illustrates this effect for profiles but it is also observed in PDD data with wavy curves. Scanning speed can also be critical for a small field in which a small volume ion chamber is being utilized. Due to the small signal, slower scan speeds will be required to help smooth out the statistical variation in the chamber signal.

III.E.3. Delay time

A delay time is introduced between measurements at two consecutive points. Longer delay time can increase data collection time but it is certainly advantageous for electron beam scanning since small ripples in water could change the data significantly.

III.E.4. Sampling time and signal

Sampling time is the time when the detector is stationary as data are being collected. The sampling time should be long enough based on the gain of the electrometer and the size of the detector (amount of signal). Before collecting data, one should check this in the penumbra region at the deepest depth and choose the appropriate sampling time. It is also advisable to check the impact of these parameters over the allocated time for commissioning.

III.E.5. Radio frequency noise interference

There is no radio frequency interference with the detector signal when conductive shielding of the entire measurement system: the shell of the chamber or diode, the cable outer braid shield, connector adapters, the electrometer connector, and the electrometer chassis, are intact. A simple conductive shield test could be performed with electrostatic charges in a dry (not humid) environment by simply shuffling of shoes on the floor and waving hands over the proximity of the components. In addition, touching the components and looking for a change in measurement response may reveal possible connection problems.

III.F. Data file

III.F.1. Data file organization

For easy data retrieval, the photon and electron beam data should be placed in separate folders with different identifiers. Furthermore, the user could subdivide photon data into open and wedged beam folders. With a good file organization, the user saves a lot of time retrieving specific data from a huge number of data files.

III.F.2. File name

As data are acquired, a file name convention should be established to assist data retrieval for later times. For many scanning systems, the file name is automatically assigned or is limited to eight characters, which greatly complicates the file naming convention process. If the file name is limited to eight characters, creativity is required to eliminate confusion and/or duplicate names. An example of a naming convention would be energy, open or wedge, and type of scan, e.g., 6P15WDD. Even if there is only a Windows type limit to the file name, a naming convention should be adopted to eliminate confusion later, such as "6 MV open depth dose set" or "18 MV 15 deg wedge 10×10 profiles." In some older systems, data files are internally managed in a single file. In such a situation, detail comments of each scan should be saved which will help in data retrieval and analysis.

IV. PHOTON BEAM DATA

IV.A. Photon scanned data measurements

The scope of data measurements will depend on the requirements of the user's dose calculation systems (e.g., TPS, monitor unit calculation system, etc.). Additional data may be measured to confirm the accuracy of the planning system

for specific treatment setups.[2] All of these data may be acquired either using beam scanning systems or point dose measurements (nonscanned data). Scanning systems are used to measure the characteristics of the beam when the parameters defining the beam are fixed. The variation of dose with depth (i.e., PDD) and off-axis position is determined by sampling the beam at different positions. The nonscanned measurements are usually performed in cases where the parameters defining the beam [e.g., field size, SSD, presence of ancillary device(s), etc.] are varied. In these cases, the output change is usually measured at a single normalization depth, so that fewer data are typically required. A spreadsheet might be helpful in organizing the amount of data to be taken as shown in Table I. Such a table also provides a place to write the name of the file when data are collected.

IV.A.1. Depth dose

The PDD measurements are taken with a fixed SSD customarily at 100 cm distance, which is typically the isocenter for most modern linear accelerators. During acceptance testing, PDD is often taken with a limited scatter device, such as the Wellhofer Buddelschif or PTW system used by the linear accelerator installer to match the beam parameters provided from the factory. It is recommended that these data should not be used for commissioning the machine. Other precautions, as mentioned earlier, regarding speed, step, gain, etc., should be followed. It is a good practice to start depth dose from the bottom of the tank rather than from the top as it minimizes the wake and disturbance in the water.

IV.A.1.a. Standard and nonstandard SSD. Normally, data should be taken as close as possible to the conditions pertinent to most clinical situations, so as not to introduce errors through auxiliary scaling operations. With a calibration depth at 10 cm, the natural SSD to represent isocentric conditions is 90 cm. Hence, the natural specification for TPS commissioning for isocentric cases would be 90 cm. However, TPS vendors might have specified 100 cm SSD for beam commissioning since there is a long tradition of such setup. Additionally, some of the current protocols for beam calibration require PDD data measured at 100 cm SSD. Independent of the SSD, the ability to model correctly the dose at any SSD should be checked as part of the beam commissioning.

Scaling of data taken from a different SSD should only be used as QA checks to ensure consistency, rather than to circumvent the need to acquire data for the specified SSD. For photon beams, several phenomena render a simple SSD correction inadequate since different components scale differently with SSD:

- Electron contamination: The surface dose and buildup region are associated with the complex behavior of electron contamination. They depend on various factors including field size, beam energy, SSD, beam modifying devices, angle of the beam, etc.[90–101] Electron contamination cannot be generally scaled by any SSD except that it can be minimized with proper techniques adopted by the manufacturer.[102,103] The relative amount of electron contamination changes with the length of the air column (standard versus extended SSD) as head scattered electrons decrease with increased scattering in air.
- Primary dose: It is well behaved and can be scaled for different SSDs just by applying the inverse square law, except for small field sizes close to what is required for lateral electron equilibrium. For such small fields, the variation of field size with depths may change the equilibrium level in a nonscalable way.
- Scatter dose: Larger projected field sizes contribute more scatter which is the main cause of the difference remaining between PDDs (at depths beyond the maximum depth of electron contamination) for different SSDs while removing the inverse square factors.
- Head scatter: It scales primarily by inverse square to the dominant source, i.e., the flattening filter. The effective center for head scattered photons is close to the flattening filter, thus the inverse square factor is different for the direct and head scattered beam components. This will imply different results both for PDD (different mix of direct to head scatter) and transversal beam profiles (the head scatter field goes outside the direct beam).
- Energy: The off axis softening is driven by the off axis angle so scatter factors for the same field size defined at the surface for different SSD will be generated with slightly different effective spectra.
- Penumbra: It cannot be scaled from one SSD to another when scanning with a chamber that has a significant spread function. If small dimension detector is not available profiles could be deconvoluted, as discussed in Sec. IV A.

For simple QA purposes, an inverse square factor could be used to scale between small differences in SSD (small field warning, see above), but otherwise the above recommendations regarding measurements should be followed.

IV.A.1.b. Conversion between PDD taken at different SSD. Percentage depth dose is often used for fixed SSD treatment and for determining other depth dose data, e.g., TPR. The PDD is customarily measured at 100 cm SSD. However, it can be measured at any distance such as SSD=90 cm. The advantage of a shorter SSD is the ease of phantom setup for coverage of large field sizes. However, PDD is a function of SSD in addition to field size (s) and depth (d). One can derive the relationship for PDD measured at different SSD as described in various references.[88,104]

IV.A.1.c. Extended distance (>100 cm) *beam data (TBI, TSEI).* For special procedures like total body irradiation, total skin electron irradiation beam data such as depth dose, TPR or TMR, profiles, should be collected at the extended distances as described by specific AAPM report.[23,24] Such data are difficult to collect due to the tank size limitation. If such data are collected they should be verified against point measurements in a large phantom.

IV.A.2. Tissue maximum or phantom ratio, TMR/TPR

TMR data are often difficult and time consuming to measure. There are water phantom systems that collect TMR/

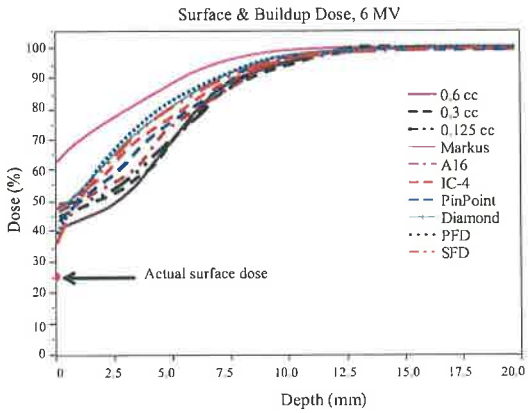

FIG. 10. Surface and buildup dose for 10×10 cm^2 field of a 6 MV beam with various detectors. The actual surface dose is also marked by the arrow.

TPR data by pumping a known amount of water for measurements at each depth. Such measurements are time consuming and the accuracy needs to be verified by independent point measurements. The simplest approach is creating TMR/TPR from depth dose measurements. Most software rely on the BJR Supplement 25 (Ref. 104) approaches (described by Khan[88]) and have built-in conversion processes. TMR at a depth d and field size r_d can be calculated from the PDD measurement as shown below

$$\mathrm{TMR}(d,r_d) = \frac{\mathrm{PDD}(c,d_r,\mathrm{SSD})}{100}\cdot\frac{(\mathrm{SSD}+d)^2}{(\mathrm{SSD}+d_{\max})^2}\cdot\frac{S_p(r,c_{d\,\max})}{S_p(r,c_d)}. \quad (2)$$

TMR values created from the above equations should be carefully verified especially at extreme field sizes and deeper depths. To create these tables, interpolation of the PDD is needed, and hence for small field TMRs, relatively smaller field PDDs are needed. When vendor provided software is used to convert the PDD to TMR, one should be extremely careful to check the calculation at small fields and deeper depths since extrapolation might result in poor results. Point measurements are recommended to check the validity of these conversions.

IV.A.3. Surface dose and buildup region

The surface dose is machine dependent, and can be affected by many parameters, including the field size, the source to surface distance, the presence of beam modifiers, and the angle of beam incidence.[97,105–115] The commissioning of an accelerator normally includes the measurement of surface dose. Because of the steep dose gradient near the surface as well as in the buildup region, careful considerations are required in the selection of detectors.[115–118] Figure 10 shows the buildup and surface dose taken with different detectors. Generally, the size of the detector along the beam direction should be as small as possible. It is highly recommended that the surface dose measurements should not be made with a scanning device.

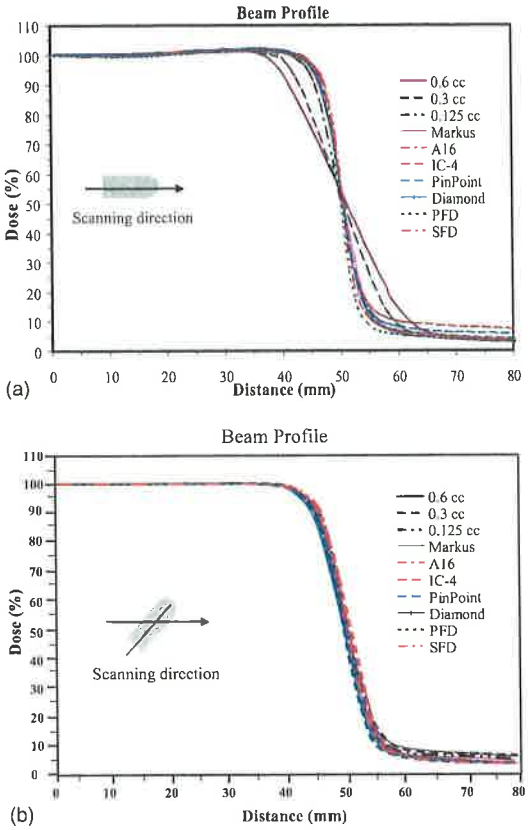

FIG. 11. Effect of chamber orientation on photon beam profiles for a 10 $\times$ 10 cm^2 fields: (a) long axis scan, (b) short axis scan with various size detectors. Only half scans are shown.

Extrapolation chambers are the detectors of choice for surface dose. However, its availability is limited and its use in surface dose measurements is very time consuming. Instead, fixed-separation plane-parallel chambers are commonly used for surface dose and the dose in the buildup region. Because of their relative large separation compared with the extrapolation chamber and their small guard ring, the plane-parallel chambers show an over-response in the buildup region and especially at the surface.[90,119] The inaccuracy may be reduced by using chambers with a small plate separation and wide guard ring. Furthermore, the chambers may exhibit a polarity effect,[90] which may be corrected by averaging the readings obtained with positive and negative polarities. Measurements of the surface dose by thin layer of TLD, diode of small active volume, MOSFET, or radiochromic film have also been reported.[117,120,121]

IV.A.4. Beam profiles

IV.A.4.a. Profiles (penumbra and off axis factors). The choice of detector orientation is critical for profile measurements for small fields and high gradient regions. The proper detector and detector orientation should be maintained when measuring a profile, as shown in Fig. 11, for relatively large fields. Figure 11(a) demonstrates the effect of chamber volume averaging when measuring a field profile and clearly

indicates that a small volume detector is preferred for profiles. Orientation and data collection, as shown in Fig. 11(b), should be used. In general, both in-plane (gun-target) and cross-plane (left-right) profiles are needed for commissioning. If there is an option to choose between in-plane and cross-plane, cross-plane profiles should be acquired since steering of the electrons in some machines is only possible in gun-target direction and prone for asymmetry and loss of flatness over a period of time. The profiles in cross-planes are usually stable and should be the choice of the direction for the data collection.

Dose profiles are collected during commissioning for input into the treatment planning computer and for additional monitor unit calculations with either manual method or commercial computer software. The profile requirements depend on the TPS; however, most TPS require profiles from very small fields to the largest field size available in order to model the penumbra and off axis factors for the open and wedged fields. The data should be collected with a maximum of 1 mm spacing in the penumbra region and preferably no more than 2 mm spacing in the remainder of the field. In converting profile data to an off-axis table, each profile needs to be renormalized to the central axis value and scaled to the distance at isocenter. Many scanning systems provide software to facilitate the process.

The number of profiles, in terms of field size and depths, are dependent on the TPS. The numbers of profiles do not need to be excessive since the basic shape of the beam does not change dramatically with depth and/or field size. Typically, profiles at 5–7 depths are sufficient for each 1 cm spaced field size up to 6×6 cm^2, and then 5 cm spacing for field sizes 10×10 cm^2 and greater is sufficient. A spacing of 5 cm with depth, with the inclusion of d_{max} profile, is usually sufficient. Some TPS require in-plane, cross-plan, and diagonal profiles and for those systems all of the required profiles should be taken.

IV.A.4.b. Star patterns. Some TPS algorithms may require beam profiles at several angles with respect to the collimator axes in a given plane. Such profiles are called star patterns typically taken at 10° interval and at d_{max} or 10 cm depth for the largest field size. Some water scanning systems have built-in software to collect the star patterns diagonally at certain angles. If such software is not available, the star pattern should be taken manually by rotating the tank on the machine pedestal at certain angular intervals, typically 10°. Star patterns provide a knowledge of the beam characteristics representative of the flattening filter.[122] The star pattern scan should never be acquired by rotating the collimator, as it does not provide the shape of flattening filter.

IV.A.4.c. Physical or hard wedge. The profiles are generally taken in the wedge direction similar to open beam and as outlined in Table I(a). Care should be taken to collect data at smaller spacing in high gradient area. Physical wedges attenuate beam in both the gradient and nongradient directions of the wedge. For large fields data should also be taken in the nongradient direction to examine the impact of rounding off, as shown by various authors,[123,124] due to oblique incidence of the beam and selectively higher attenuation at off axis.

IV.A.4.d. Soft or electronic wedge. Soft or electronic wedge (dynamic or virtual wedge) profiles require different type of data collection equipment than the standard scanning system. Since the soft wedges are formed by the moving machine jaws while the beam is on. The standard scanning system utilizing a single chamber cannot be used to collect such wedge profiles. The types of detector systems such as films and linear detector arrays (ion chamber or diode) which can be mounted on the scanning arm[44,45,59] have been used, since all the measurements are being made in water under conditions of full scatter. However, the numbers of scanning systems that offer this option are limited and the cost for a one-time application may be difficult to justify for some institutions. Another option is to use a diode array, such as the profiler (Sun Nuclear, Melbourne, FL) with different thickness of solid or virtual water slabs to achieve various thickness up to at least 20 cm. These diode arrays have been shown[45] to give good agreement with water scans and in most cases, commercial software exists to convert the diode array profiles to a format which the treatment planning computer can read. However, the profiler is limited in the maximum field size that can be measured. Another option is to use film dosimetry with a film sandwiched between slabs of solid or virtual water, and imaging software for analysis. With film dosimetry, the film must be calibrated to generate a density vs. dose response curve. A good QA on the film processor is also required. A problem with film dosimetry is its spectral dependence of the sensitometric curve.[21] Film size limitation is another problem that should be considered.

IV.B. MLC data

MLC is now an integral part of a linear accelerator and is available in various sizes (regular, mini, and micro) that have been developed for specific uses depending upon the leaf widths. The mechanical stability and characteristics should be known and verified during the acceptance testing of the machine which has been reported for various manufacturers.[125–145] In general, MLC commissioning data depend on the clinical usage but more importantly on the TPS. Detail discussions on the various MLC designs and their commissioning had been provided by the AAPM Report 72 (Ref. 145) and IPEM Report 94.[16] However, some of the parameters, as described below, should be quantified for each photon energy and a minimum of four gantry angles (0°, 90°, 180°, 270°) to examine the effect of gravity on leaf motion.[146,147]

- Light and radiation field congruence
- Interleaf leakage (leakage between two leaves)
- Intraleaf leakage (transmission though a leaf)
- Tongue and Grove effect across the field
- Penumbra.

In addition, positional accuracy critical in dosimetry[148] may be determined either with film or electronic portal imagers.[147,149] For MLC with curved end leafs, an offset for the leafs positioning should be determined to account for the fact that the 50% isodose line is not at the tip of the curved ends.[141] Except penumbra, all these parameters should be

acquired using film dosimetry. Inter- and intraleaf leakage could be measured with a well calibrated film or portal imager that provides high resolution data. For MLC with backup jaws, the data should be acquired with jaws retracted. A reference film at a reference depth should be exposed that provide correlation between optical density and dose. The MLC leaves should be closed with the non-MLC jaws retracted to fully open positions. A large film that covers the entire MLC leaves should be exposed. If the film is small compared to the MLC field size, SSD could be decreased. This will help reduction in MU which is typically 10–20 times the reference MU. After processing the film, it should be scanned and proper correction factors should be applied to convert optical density to dose to quantify the inter- and intraleaf leakage. These values should be compared with published data in the literatures[150] for the type of manufacturer.

IV.C. Photon point dose data

The data required by TPS vary considerably from one system to the other. However, at least for manual dosimetry calculations, the following data should be collected.

IV.C.1. Total scatter factor (S_{cp})

The relative output from a treatment machine is defined as the dose for a given field in water relative to the same quantity in a reference geometry, which usually is the reference depth and field size. The total scatter factor, S_{cp}, is defined as the ratio of the dose for the same monitor units (M) for the field of interest to the dose for the reference field, both measured in a large water phantom with the detector at a reference depth at the isocenter

$$S_{cp}(s) \equiv \frac{D(s,d_{\text{ref}})/M}{D(s_{\text{ref}},d_{\text{ref}})/M}, \tag{3}$$

where D is the dose measured in phantom, in this case at the reference depth d_{ref}, and for the field size, s, and the reference field size, s_{ref}, and M is the monitor unit. The use of a large water phantom ensures that full lateral buildup is established for the field in question. The depth of water beyond the deepest point of measurement in the phantom should be at least 10 cm to ensure full backscatter. It should be noted that the values determined at depth (e.g., 10 cm) will be significantly different from the values determined at $d_{\max}$, thus it is important to know what data is required before proceeding.

IV.C.1.a. Measurements. Relative output should be measured in water at a defined reference point (e.g., at 10 cm or $d_{\max}$), 100 cm SSD or SAD for a variety of field sizes as shown in Table I. Ideally, the data should be collected in the same manner as the machine is calibrated, i.e., SSD or SAD calibration. If IMRT data are required, the relative output in water should be measured with a small volume chamber for small field sizes. The chamber dimension must be small compared to the smallest field size, e.g., less than 0.5 cm in any dimension (diameter or length) to avoid chamber averaging effects. It is suggested that these data can be compared to data collected with a larger chamber for larger field sizes to see if the data overlap and form a smooth curve of S_{cp} versus field size. On occasion, the small volume chamber may exhibit significant stem effect or effect of cable irradiation for the reference 10×10 cm^2 field. Also, it is known that the readings for $\leq 3\times3$ cm^2 field may have chamber volume averaging effects and consequently the readings may be 5–10% lower than the true value, depending on precision of chamber positioning and beam profile.[151–153]

IV.C.1.b. Monte Carlo approaches. It has been proven that the Monte Carlo method can precisely model the physical processes involved in radiation therapy and is powerful in dealing with any complex geometry.[154–156] In principle, the Monte Carlo technique can produce accurate dose calculations, under almost all circumstances, provided that relevant phase space data are available and the calculations have been benchmarked appropriately. By simulating the detailed accelerator head geometry, Monte Carlo techniques can provide accurate information about the particles emerging from each component of the accelerator head, which can be used to characterize the beams.[157–159] In particular, Monte Carlo studies have been carried out to (1) determine the relative scatter factors, (2) analyze the various components of the scatter factor, and (3) designs new methods to measure the scatter factor.[10,11,13] For example, Monte Carlo simulations have shown that scatter contributions from collimators (such as jaws and MLC leaves) are significant for small fields.[160–162] Monte Carlo approaches have been introduced for either validating the measurements or generating the small-field data.[13,153,163,164]

IV.C.2. In-air output ratio (S_c)

This quantity is also called in-air output factor,[165] collimator-scatter factor,[88] or head scatter factor.[166,167] The latter two names were somewhat misleading since they emphasized a single component of the output ratio. The TG-74 (Ref. 20) report describes the details of the in-air output ratio, S_c, and defines it as the ratio of primary collision water KERMA in free-space, K_p, per monitor unit (M) between an arbitrary collimator setting and the reference collimator setting at the same location

$$S_c \equiv \frac{K_p(c;z_{\text{ref}})/M}{K_p(c_{\text{ref}};z_{\text{ref}})/M}, \tag{4}$$

where c is the arbitrary collimator setting, c_{ref} is the reference collimator setting, usually 10×10 cm^2, and z_{ref} is the reference source-to-detector distance, usually 100 cm. Notice that the primary collision kerma excludes the scattered collision kerma generated in any surrounding phantom but includes all scattering that has occurred in the treatment head.

Experimentally, S_c can be determined as the ionization ratio measured in a miniphantom with sufficient thickness to eliminate electron contamination.[32] The lateral dimensions of the miniphantom should provide lateral electronic equilibrium at the detector, as well as filter contaminant electrons from the side. The material composition of the miniphantom

must be carefully chosen so that significant medium-based deviations in water kerma ratios due to spectral differences between beam c and c_{ref} are not introduced. However, in situations when the beam quality is different from reference conditions (e.g., while using physical wedges), it has to be noted that S_c, as an estimator of the energy fluence ratio, is biased by the collision kerma and attenuation at measurement depth.

Traditionally, S_c is measured using an ion chamber with a buildup cap. The selection of buildup cap is very important. It is better to err on the side of excess buildup material than too little. If the buildup cap is not of sufficient thickness, the chamber will respond not only to the electrons generated by photon interactions in the cap, but also to the electron contamination in the beam, which can produce erroneous results. The reader is referred to the report from TG-74 for the appropriate dimensions of the buildup cap. The indication of insufficient buildup cap thickness is the presence of pronounced in-air scatter ratio (S_c) with field size, which in turn will cause the calculated phantom scatter factors (S_p) to become flat with field size. For small field sizes ($\leq 4\times 4$ cm^2) extended distance can be employed if one has to use the same water-equivalent miniphantom. It is important also to measure the output factor at 10×10 cm^2 at an extended distance so that the two sets of output factors measured at different SSDs can be merged. TG-74 recommends using high-Z miniphantom and making the measurement at the same SSD as those for other field sizes ($>4\times 4$ cm^2). The minimum field size is determined by the requirement that there is sufficient "flash" of at least 1.0 cm around the miniphantom.

IV.C.3. Phantom scatter factor (S_p)

The phantom scatter factor, S_p, is defined as the ratio of the scatter factors between the actual field size, s, in the phantom and that of the reference field size, s_{ref}, both at the reference depth, d_{ref},

$$S_p(s) \equiv \frac{SF(s,d_{ref})}{SF(s_{ref},d_{ref})}, \tag{5}$$

where SF is the ratio of the total dose in water (D) to the primary dose (D_p) for the same field size and depth at the same location. The phantom scatter factor can be approximately determined by

$$S_p(s) \approx \frac{S_{cp}}{S_c}. \tag{6}$$

In deriving S_p in Eq. (6), we have used Eqs. (3) and (4) which define S_{cp} and S_c, respectively. Using the primary dose-to-collision kerma ratio, β_p, one can relate the primary dose $D_p=\beta_p\cdot K_p$, to the primary water collision kerma. Equation (6) holds exactly if the primary dose-to-kerma ratio is field size independent: $\beta_p(s)=\beta_p(s_{ref})$.

IV.C.4. Wedge factors

IV.C.4.a. Physical wedge. Generally, a wedge factor is a function of wedge angle, depth, x-ray energy, and field size as noted by various authors.[168–173] Hard or physical wedge factors should be measured at the reference depth (10 cm or d_{max}), 100 cm SSD for different field sizes. For some accelerators, the wedge factor is a strong function of field size, for which a larger range of field sizes should be included in the measurement.[170,171,174] Most planning systems allow the user to specify the particular field sizes for wedge factors.

Due to the inaccuracy of placing the detector at the exact beam center, it is necessary to first center the chamber in the beam, with detector axis along nonwedged direction by taking readings with a 60° wedge at two collimator angles (180° apart). Once the detector is centered in the beam, one must acquire readings at one wedge orientation and then repeat the measurements with the wedge reversed 180 deg. The wedge factor is taken as the average of the two wedge orientation readings divided by the open field reading at a single collimator angle. The wedge factor measured at depth can be significantly different from the wedge factor measured at d_{max}. Typically, the TPS will dictate the depth of measurements for wedge factors. However, for manual dosimetry tables in which both open field and wedged field PDD and TMR tables are present, it may be appropriate to use wedge factors measured at d_{max} to avoid correcting for beam hardening twice. When two sets of physical wedges are available, for example Varian's lower and upper wedges, data need to be verified. It is advisable to spot check the wedge factors for field size and depth; however, Cheng *et al.*[175] found that wedge factors are nearly identical for lower and upper wedges.

IV.C.4.b. Soft wedge. Soft wedges are electronic wedges or nonphysical wedges known as dynamic or virtual wedges that vary in operation depending upon the manufacturer. Enhanced dynamic wedge (EDW) is used by Varian, while the virtual wedge (VW) is used by Siemens.[176–179] Both vendors utilize the movement of one Y-jaw to simulate a wedge, while keeping the other Y-jaw stationary. The major difference between EDW and VW is that for EDW, both the jaw speed and the dose rate are variables, while in VW, the jaw speed is constant and the dose rate varies according to an analytical function.

The wedge factors for these different types of electronic wedges can be quite different from physical hard wedge factors. The wedge factors for the EDW, defined at a depth of 10 cm at the center of the open field, exhibit field size, and wedge angle dependency, with values 10%–30% higher than the corresponding physical wedges. Studies have shown that the wedge factors for the EDW are independent of depth because the beam quality is not changed by these wedges.[175,180] By contrast, the Siemens virtual wedge factors exhibit values of $1.0\% \pm 2\%$ with no observable relationship between wedge factors and field size or wedge angle. Wedge factors should be measured at the reference depth as specified by the vendor (10 cm or d_{max}) at 100 cm SSD or SAD for different field sizes. Additional wedge factors for rectangular field should be measured since wedge factor seems to have a greater dependence on the moving jaw dimension than the fixed jaw position. For example, Varian EDW wedge

factor for 10×20 cm^2 will have a value very similar to the wedge factor for 10×10 cm^2, a phenomenon that is not present with physical wedges.

IV.C.4.c. Universal wedge. Elekta accelerators use the combination of an open field and a built-in 60° physical wedge to achieve different wedge angles by software control. The wedge is motorized so that it can be moved in and out of the field. This type of wedge system is known as an internal or universal wedge. The wedge factor should be measured for various field sizes and at various depths, as required by various TPS and described in various publications.[181–184]

IV.C.5. Tray factors

Transmission factors for blocking trays, jaws, and MLC are measured at reference depth (10 cm or d_{max}) in water,[185] and are defined as the ratio of the reading with the blocking tray or jaw or MLC bank to the reading for the same point in the open field. Due to the small transmission through the jaws and/or MLC bank, a large monitor unit setting is often required to ensure readings are collected in the linear range of the electrometer/detector system and to ensure good statistics. Tray transmission factors may also be measured without a water phantom system.

IV.C.6. Small field considerations

Traditionally, fields in radiation therapy span from 4 $\times4$ cm^2 up to 40×40 cm^2. However, in advanced and specialized radiation treatments, such as IMRT, SRS, CyberKnife, and gamma-knife, extremely small fields of the order of few millimeters are used. A detailed list of problem and future trend in the dosimetry of small field has been described by Das *et al.*[152] Small-field dosimetry is challenging due to lack of lateral electronic equilibrium,[186] overlap of the geometrical penumbra due to the size of detector,[152] change in energy spectrum and associated dosimetric parameters, and stopping power ratio.[163,187–189] Several problems and trends in the dosimetry of small field have been covered in some detail by several authors.[11,13,64,66,67,151,152,163,164,187–202]

Small volume detectors should be used that have minimum energy, dose, and dose rate dependency. Microion chambers are best suited for small field dosimetry; however, their signal-to-noise issue should be evaluated. Additionally, perturbation factor of these detectors should be taken into account, as shown by Sauer *et al.*[164] and Francescon *et al.*[153] If a scan through the field center varies more than 1% over the range of the detector diameter, consider changing to a smaller detector. Output factors are very sensitive to the position of the detector. Thus, verification of centering of the detector is important.[151,202] This could be performed by scanning across the field in both lateral dimensions to check that the maximum along each dimension coincide. A more elaborate method has recently been proposed by Li *et al.*[203] The actual field size used during the output measurements should also be verified, since a small error in the field size setting will produce a large error in the output. However, the full width at half maximum estimated from (correctly measured) profiles for fields where lateral disequilibrium prevails will not yield the correct field sizes. They will overestimate the field size since the half maximum is now located at lower dose levels, i.e., closer to the toe end of the profile as the maximum is less than the equilibrium value. An independent check and calibration of the light field, or shifting position of the leaves, might provide a means for field edge location checks.

V. ELECTRON BEAM

V.A. Electron scanned data measurements

V.A.1. Depth dose

Electron beam depth doses differ significantly among institutions and manufacturers as shown by Followill *et al.*[204] It is therefore recommended that each electron beam data should be measured during commissioning. Diode detector, parallel plate ion chamber, cylindrical ion chamber, and films are the most commonly used detectors in electron beam scanning. It is extremely critical to establish the correct zero depth to obtain good percent depth dose data. For cylindrical ion chambers, 0.5 radius shift for the point of measurement relative to the chamber center can be used.[56,145] A quick depth ionization scan for a low energy (e.g., 6 MeV) electron beam can be used to check if the zero depth is set correctly. The resultant curve will have a well-defined d_{max}, with an average value of 1.1 ± 0.2 cm for 6 MeV, regardless of the vendors. A measured ionization d_{max} outside of this range by more than 0.2 cm may indicate an error in establishing zero depth. Percent depth ionization curves should be scanned for all energies for the reference cone to a depth of R_p+10 cm with depth increment of 0.1 cm. In electron beam commissioning, the 10×10 cm^2 or 15×15 cm^2 cones are commonly chosen as the reference cone. From these percent depth ionization curves, the following depths: d_{max}, d_{90}, d_{80}, d_{70}, d_{60}, d_{50}, d_{40}, d_{30}, d_{20}, and R_p can be determined to define the depths of the profile scans. Note that strictly speaking, R_p should be determined from the depth dose data corrected for beam divergence. However, for SSD $\geq$ 100 cm, the difference in R_p obtained from depth ionization data is not clinically significant from that determined from the depth dose data.

When an ionization chamber is used for measuring depth ionization curves in a water phantom the readings should be converted to the corresponding depth dose curves using the appropriate replacement correction factors and restricted stopping power ratios. Most scanning systems have built-in software to convert ionization to dose. However, the accuracy of the conversion must be verified at selected positions based on the data provided in the references.[22,56,88,205]

Scanning speed, delay time, and sampling time as described in Sec. III should be properly evaluated for electron beam scanning as these parameters impact the quality of the scan. Figure 12 shows the effect of water ripple on an electron depth dose curve. Any abnormal depth dose characteristics should be investigated in terms of scanning parameters. The ideal detector for electron beam scanning is a small vol-

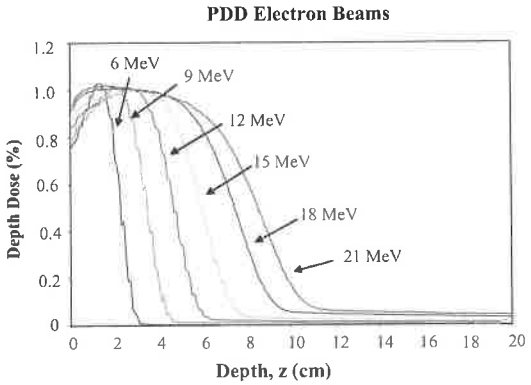

FIG. 12. Effect of water ripple on low energy electron beam depth dose.

ume electron diode since it does not require an ionization reading to dose conversion and there is no shift in its position except for a small amount of waterproof coating on the top the detector; typically ~0.2 mm.

For some TPS, accurate knowledge of bremsstrahlung radiation is important. The component of bremsstrahlung radiation can be accurately acquired by the method described by Zhu *et al.*[206] In this method, bremsstrahlung is divided into three components (head, cerrobend, and water) and measured by eliminating different components. If the PDD for an electron cutout is measured with an electron diode, the bremsstrahlung component is usually inaccurate since electron diodes do not respond accurately to photons.

V.A.2. Profiles

While dose profiles are typically measured at various depths such as d_{max}, d_{90}, d_{70}, d_{50}, d_{30}, and d_{10}, i.e., depths at 100%, 90%, 70%, 50%, 30%, and 10% dose, respectively, but may vary depending on the specification of the planning system. When collecting profile scans, attention should be given to the profiles at depths greater than d_{max}, especially for the low energy electrons. If a pronounced asymmetry is observed in the profiles, the leveling of the tank and/or scanning arm and accuracy of gantry angle should be rechecked. With low energy electron, it is common to see "ragged" scans, especially at large depths. Several factors should be examined: the gain of electrometer, placement of the reference probe, the direction of scan motion, the probe motion rate, and/or sampling time, and/or repetition rate on machine to see if the scans could be improved. For some linear accelerators, the profiles could be improved also by turning off the dose servo; however, it should be verified also in clinical mode. For certain scanning systems, the profiles could be improved by readjusting the autogain setting and background. Yet, for some linear accelerators, the only solution appears to be slowing down the scan rate and increasing the sampling time as beam profiles are very sensitive to scanning speed for low energy beams and at deeper depths as shown in Fig. 9.

V.B. Electron point dose data

V.B.1. Cone factors

Cone output factors are defined as the ratio of dose at d_{max} for a given cone to the dose at d_{max} for the reference cone; typically 10×10 cm^2 or 15×15 cm^2. Cone factors should be measured in a water tank or in solid phantom with size $\geq30\times30$ cm^2 if the output of the 25×25 cm^2 cone is measured. Different machines of the same make and model may have different cone output factors (e.g., the cone output factors may be different for two different 21EX machines), although the difference may not be large, e.g., <2%. It is recommended to verify cone factors of all cones for all energies to confirm if the cone factors of one machine can be used for the other machine of the same model.

V.B.2. Cutout factors

A cutout factor is the ratio of the dose with and without the cutout for a given cone measured at their respective d_{max} depths. It is useful to prepare a table of cutout factors as a function of energy for standard cutouts for clinical applications where the respective d_{max} is specified. Cutout shapes include rectangles, circles, ellipses, and squares. The standard cutout output factors are usually tabulated versus their equivalent squares. The calculation of equivalent squares and output for electron beams is discussed in various references.[22,56,205,207] For very small cutouts (e.g., 1×2 or 2×2 cm^2), the d_{max} may be different from that of a larger cutout and should be determined for the cutout measurement. The choice of ion chamber and its placement for small cutouts are critical. Cutout factors at extended distance (e.g., 110 cm SSD) may be determined by measurement, or by calculation, using the virtual SSD determined for a set of standard cutouts during machine commissioning and the cutout factor at 100 cm SSD. Agreement within 2% can be achieved between the two methods. There are several methods listed in the literature[208,209] that use a sector integration technique similar to the Clarkson method to predict cutout output (dose/MU) for any irregular cutout at any SSD with accuracy within ±2%.

V.B.3. Virtual and effective source position

Due to electron scattering through various materials in its path, electron beams do not follow a strict inverse square law. In particular, a high abundance of indirect radiation scattered from collimators and cones are not amenable to characterization by a single source.[210] For beam characterization, there are empirical approaches to solve this problem by determining the source position that would allow the use of inverse square law.[56] The gap method and σ_{θ_x} method[205,211] have been suggested for the estimation of the virtual source. The gap or effective SSD method, as described by Khan[88], allows the user to use the inverse square law to calculate electron dose at any distance. This method is relatively simple and requires the determination of the effective SSD for electron beams, which depends on the machine, field size, and beam energy.[212–216] By taking measurements at d_{max}

at various air gaps between the electron cone and water surface, a plot of the square root of I_0/I and the gap gives a straight line with a particular slope that provides the effective SSD. Sigma-theta-χ (σ_{θ_χ}) is the root-mean-square value of the Gaussian projected angular distribution at the plane of the final collimating device as described by ICRU-35 (Ref. 205) and van Battum *et al.*[211] This method requires in-air profile penumbra (80%–20%) for different isocenter-to-detector distance for the largest cone that can be measured with films[217] or a diode.[34]

V.B.4. Specific data for Monte Carlo based dose calculation

Many studies have been carried out on the commissioning of electron beams using Monte Carlo simulation.[13,157,210,218–221] These studies have demonstrated the potential of Monte Carlo techniques for generating beam data normally obtained by measurement during the commissioning. The data including the phase space data (i.e., the charge, position, direction, energy, and history tag for each particle), may be required for Monte Carlo based treatment planning. Monte Carlo simulations need to be combined with measurements to validate the Monte Carlo calculations. In addition to those conventional measured data (e.g., PDD, profiles, output factors, absolute dose), there may be other commissioning information required for a Monte Carlo based system.[9,13,220–226] During electron beam commissioning, data for validating Monte Carlo generated energy spectrum and dose calculation can be acquired. Different Monte Carlo algorithm, such as voxel Monte Carlo[222] or macro Monte Carlo,[223,224] may require a different set of data specific for commissioning.

VI. PROCESSING BEAM DATA

VI.A. Processing and manipulations

Following collection of both scan and nonscan beam data, it may be necessary to do some processing before entering the data into a TPS. For scan data, most scanning systems have numerous tools to process beam data, such as smoothing, centering of the beam, and making the beam symmetrical. The amount of processing depends on the type of scanner (e.g., scanning with diodes or in continuous dose rate mode), the accuracy of setup, and characteristics of the machine itself.

VI.B. Smoothing, mirroring, and summarizing

All measured data have a varying degree of noise depending on the system. Smoothing and filtering routines help remove noise and extract actual data. This is also a low pass filtering, i.e., it eliminates high frequencies (abrupt, sharp, spike, and wiggle). Numerous smoothing routines exist, i.e., least square, median, arithmetic mean, geometric mean, moving average, cubic spline, exponential, envelope, Gaussian, Fourier transform, and Beziér.[227–229] However, not all routines will give acceptable results. Typically, one must experiment with different smoothing routines available to see which routine produces the desired results without compromising the basic shape of the scan curve, i.e., eliminate the noise in the scan without changing the basic shape, such as clipping the peak in dose profile of 60° wedge. If the degree of smoothing required is excessive, consideration should be given to repeating the scan using slower scan speeds and/or increased sampling time to improve the data acquisition. The centering tool on most scanning systems works well with open fields. However, if the amount of recentering is excessive (e.g., >0.05 cm), consideration should be given to improving the scanning setup to achieve better centering on the beam since the centering tool will not work on the wedged fields, thereby introducing an error in the position. Most scanning software has a "make symmetrical" or "mirror" tool which works well with open fields. However, if the amount of asymmetry being removed is excessive (e.g., >0.5% asymmetry) in an open field scan, either the scanning setup should be checked for level or the machine adjusted to improve symmetry as there is no method to remove open field asymmetry from a wedged field. With all these tools, if significant processing, i.e., centering, smoothing, mirroring to correct for asymmetry, is required, it is recommended that consideration be given to recollecting beam data as a good data set should require minimal processing.

VI.B.1. Mathematical functions and filters

Most scanning systems provide a complete description of the functions and filters used for smoothing, mirroring, and summarizing. Refer to the manufacturer's description for information relevant to your system. In general, moving average, cubic-spline, interpolation, and Fourier transform type of functions are available on scanning software. The user should use caution and check the validity of these functions by comparing published reference field data.

VI.B.2. Distortion in smoothing

Most scanning systems have various filters to smooth data. The most common one is the cubic-spline method. Smoothing original data often distorts the data, which are pronounced in the high gradient region, such as penumbra and in wedge profiles. Figure 13 shows the impact of smoothing with an iterative approach. There is no rule or published information as to how much smoothing should be allowed. However, the user should use common sense not to distort the data but simply to smooth it. One to two passes of smoothing should be acceptable. It is always a good practice to keep the original data intact for future evaluation.

VI.C. Processing nonscanned data

For nonscan data, it is recommended that all the beam parameters be plotted to highlight obvious errors (i.e., outliers on curve) to improve the accuracy of data entered into TPS. For example, the plot of output factors (S_c,S_p) versus field size should exhibit a smooth curve with slope that is steep for small fields and relatively flat for large fields.

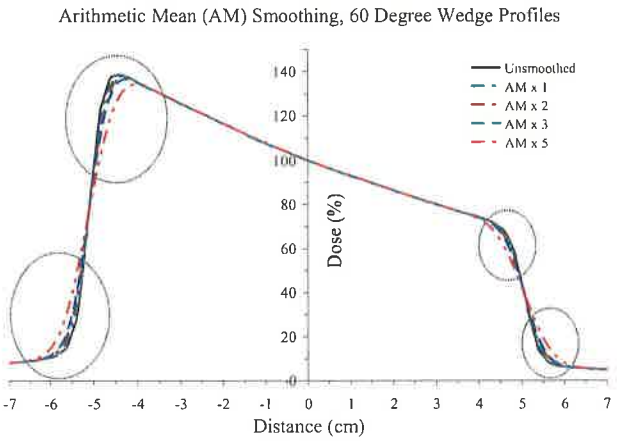

FIG. 13. Effect of data smoothing on the 6 MV 60° wedge profiles. Circles are drawn to show the effect of smoothing.

Points, which obviously do not fit the curve, should be rechecked for computational errors or remeasured, if necessary, to improve the accuracy of the data.

VII. SUMMARY AND RECOMMENDATION

VII.A. Recommendations

As with any report, this document reflects the state of the art at the time of writing, but will age as developments take place in the machine, planning, and measurement technologies. Some of these developments may conflict with recommendations in this report, so the reader should always review recent developments and use this report as a general guide.

(1) Define the scope of data collection based on type of machine, requirements specific to the TPS, operational difficulties, machine's operational condition, and beam energies.
(2) Roughly, calculate the time needed to commission the machine based on assumption as noted in Eq. (1).
(3) Use a proper detector that has high sensitivity, small dimensions, low noise, and minimum dose rate and energy dependence.
(4) Ion chambers with small volumes are generally preferred for relative dosimetry in a photon beam.
(5) Diodes are preferred detectors for relative dosimetry in an electron beam except the bremsstrahlung portion where an electron diode may have a different photon response. For accurate measurement of a bremsstrahlung component, an ion chamber should be used.
(6) Verify the labeling and positional accuracy of the scanning system before starting measurements.
(7) Set optimal speed, time delay, and acquisition time for the scanning system.
(8) Scan from the deepest depth to the surface rather than surface to depth when scanning for PDD.
(9) Adjust the step size for data collection appropriately to optimize the time needed for the collection and accuracy of data.
(10) Maintain proper bias and polarity of detectors, if required.
(11) Minimize the amount of cable in the beam.
(12) Orient the detector mount so that it provides the highest resolution.
(13) Use normalization points and procedures that are as close as possible to the reference conditions for TPS; for photon beams pay particular attention to avoid errors from electron contamination at superficial depths, i.e., avoid d_{max} normalizations.
(14) Write a concise report with all the collected data.
(15) Check on the report and collected data. Have a qualified medical physicist perform an independent audit of the collected data and subsequent report.
(16) Backup entire electronic data, analyzed data, and spread sheets.
(17) Vendor provided data could be used as a reference but it should never be used as a substitute for the commissioned data.

VII.B. Precautions

(1) Do not rely on the manufacturer supplied beam data. Always verify the accuracy since beam data can vary from machine to machine of the same model from the same vendor.
(2) Do not use acceptance testing data for commissioning data, as these are for reference purposes only and are often taken under limited scatter condition.
(3) Do not scan in the axial direction of the detector.
(4) Do not overprocess the data by smoothing or the use of mathematical filters.
(5) Pay attention to the data collected. Any anomaly should be investigated and understood immediately before proceeding to further scanning.
(6) Check the water phantom level at least once a day.

VII.C. Commissioning report

It is recommended that a clear and descriptive report of the commissioning data with proper signature and date be written so that this data can be verified in the future and in case of litigation, some degree of accountability can be maintained. The following is a sample of what should be included in the report.

(1) Formal commissioning report, which clearly outlines the scope of the project, what was measured, how, what equipment was used, and the results, with appropriate attention to describing normalization procedures
(2) Open field x-ray PDD and TMR tables
(3) Wedged field x-ray PDD and TMR tables
(4) X-ray output factor tables (S_{cp},S_c,S_p)
(5) Field size and depth dependent wedge factor tables
(6) Soft wedge (electronic wedge) factor tables
(7) Transmission factor tables
(8) Open field off axis tables at selected depths, large field sizes

(9) Wedge field off axis tables at selected depths, largest field size for wedge
(10) Soft wedge off axis tables at selected depths, largest field size for wedge
(11) Electron cone ratios and effective source distances
(12) Electron PDD tables
(13) Provide at least selected isodose curves for reference fields both for electron and photon beams from PDD and profiles.
(14) Printout of all scan data
(15) Compare data from similar machines within your own department or from different institutions. Comparison to vendor supplied golden data is also acceptable but do not blindly use this data.
(16) Vendor provided data could be used as a reference but it should never be used as a substitute for the commissioned data.
(17) Backup entire electronic data, analyzed data and spread sheets.
(18) Write the report with detailed description of how the beam data were collected and conditions of the beam data collection.

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Task Group 142 report: Quality assurance of medical accelerators[a)]

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The task group (TG) for quality assurance of medical accelerators was constituted by the American Association of Physicists in Medicine's Science Council under the direction of the Radiation Therapy Committee and the Quality Assurance and Outcome Improvement Subcommittee. The task group (TG-142) had two main charges. First to update, as needed, recommendations of Table II of the AAPM TG-40 report on quality assurance and second, to add recommendations for asymmetric jaws, multileaf collimation (MLC), and dynamic/virtual wedges. The TG accomplished the update to TG-40, specifying new test and tolerances, and has added recommendations for not only the new ancillary delivery technologies but also for imaging devices that are part of the linear accelerator. The imaging devices include x-ray imaging, photon portal imaging, and cone-beam CT. The TG report was designed to account for the types of treatments delivered with the particular machine. For example, machines that are used for radiosurgery treatments or intensity-modulated radiotherapy (IMRT) require different tests and/or tolerances. There are specific recommendations for MLC quality assurance for machines performing IMRT. The report also gives recommendations as to action levels for the physicists to implement particular actions, whether they are inspection, scheduled action, or immediate and corrective action. The report is geared to be flexible for the physicist to customize the QA program depending on clinical utility. There are specific tables according to daily, monthly, and annual reviews, along with unique tables for wedge systems, MLC, and imaging checks. The report also gives specific recommendations regarding setup of a QA program by the physicist in regards to building a QA team, establishing procedures, training of personnel, documentation, and end-to-end system checks. The tabulated items of this report have

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been considerably expanded as compared with the original TG-40 report and the recommended tolerances accommodate differences in the intended use of the machine functionality (non-IMRT, IMRT, and stereotactic delivery). © *2009 American Association of Physicists in Medicine.*
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Key words: accelerator, QA, quality assurance, radiotherapy

TABLE OF CONTENTS

I. INTRODUCTION

I.A. Purpose

The AAPM TG-40[1] report published in 1994 is a widely used and referenced document which includes recommendations for general quality assurance (QA) tests for medical linear accelerators. Since the publication of TG-40, several new technologies have been developed and are now commonly used in clinical practice. These technologies include multileaf collimation (MLC), asymmetric jaws, dynamic and virtual wedges, and electronic portal imaging devices (EPIDs). Image guidance devices such as cone-beam CT (CBCT), static kilovoltage (kV) imaging, and respiratory gating were rarely used in 1994. In addition, TG-40 did not consider the demands placed on an accelerator by procedures such as stereotactic radiosurgery (SRS), stereotactic body radiation therapy (SBRT), total body photon irradiation (TBI), and intensity-modulated radiotherapy (IMRT) treatment. Also, the quality of linear accelerators in terms of accuracy and precision has improved in recent years, allowing for procedures such as SRS, SBRT, and IMRT.

The purpose of this report is to build upon the recommendations of TG-40 for QA of medical linear accelerators including the before mentioned technologies (MLC, newer wedge systems, asymmetric jaws, imaging systems, and respiratory systems) and procedures such as SRS, SBRT, TBI, and IMRT. During the development of this report, investigation of technologies that deliver MLC-based IMRT with simultaneous gantry rotation had just begun, and therefore QA for these technologies is not included in the report.

The recommendations of this task group are not intended to be used as regulations. These recommendations are guidelines for QMPs to use and appropriately interpret for their individual institution and clinical setting. Each institution may have site-specific or state mandated needs and requirements which may modify their usage of these recommendations.

I.B. Background

The underlying principle behind TG-40 was the International Commission on Radiation Units and Measurements[2] (ICRU) recommendation that the dose delivered to the patient be within ±5% of the prescribed dose. Taking into consideration the many steps involved in delivering dose to a target volume in a patient, each step must be performed with accuracy better than 5% to achieve this recommendation.

The goal of a QA program for linear accelerators is to assure that the machine characteristics do not deviate significantly from their baseline values acquired at the time of acceptance and commissioning.[3] There are several publications that describe procedures and conditions for acceptance testing and commissioning, and the reader is referred to these: The International Electrotechnical Commission[4,5] (IEC), American Association of Physicists in Medicine[3,6,7] (AAPM), and American College of Medical Physics[8] (ACMP). Many of these baseline values are entered into treatment planning systems to characterize and/or model the treatment machine, and therefore can directly affect treatment plans calculated for every patient treated on that machine. Deviation from the baseline values could thus result in suboptimal treatment of patients. Machine parameters can deviate from their baseline values as a result of many reasons. There can be unexpected changes in machine performance due to machine malfunction, mechanical breakdown, physical accidents, or component failure. Major component replacement (waveguide, bending magnet, etc.) may also alter machine performance from the original parameters. In addition there can be gradual changes as a result of aging of the machine components. These patterns of failure must be considered when establishing a periodic QA program.

It is not the goal of this report to describe the experimental techniques for performing QA tests, as these tests are described in a number of publications.[9–35] We also realize the increased demands on staff in the current healthcare environ-

TABLE I. Daily.

Procedure	Machine-type tolerance		
	Non-IMRT	IMRT	SRS/SBRT
Dosimetry			
X-ray output constancy (all energies)			
Electron output constancy (weekly, except for machines with unique e-monitoring requiring daily)		3%	
Mechanical			
Laser localization	2 mm	1.5 mm	1 mm
Distance indicator (ODI) @ iso	2 mm	2 mm	2 mm
Collimator size indicator	2 mm	2 mm	1 mm
Safety			
Door interlock (beam off)		Functional	
Door closing safety		Functional	
Audiovisual monitor(s)		Functional	
Stereotactic interlocks (lockout)	NA	NA	Functional
Radiation area monitor (if used)		Functional	
Beam on indicator		Functional	

ment and recognize the fact that the tests should be simple, rapid, and reproducible. Since the publication of TG-40 there have been many QA products designed around the TG-40 table that make execution of these tests more efficient. TG-40 stated that the test procedures should be able to distinguish parameter changes smaller than tolerance or action levels. A definition of *repeatability* is included in Sec. II C.

As noted in TG-40, the QA program for linear accelerators is very much a team effort, and the responsibilities of performing various tasks are typically divided among physicists, dosimetrists, therapists, and accelerator engineers. However, we reiterate the recommendation that the overall responsibility for a linear accelerator QA program be assigned to one individual: The qualified medical physicist (QMP).

The foundation of linear accelerator based QA lies in Table II of TG-40. Since its publication linear accelerators have changed not only with respect to their physical construction but also in their role as treatment devices. Asymmetric jaws, dynamic/virtual wedges, and multileaf collimators have been added. Intensity-modulated radiation therapy and image-guided radiation therapy (IGRT) have increased demands on the accuracy required of the linear accelerator for precise dose delivery. The types of treatments delivered with the machine should also have a role in determining the QA program that is appropriate for that treatment machine. For example, machines that are used for SRS/SBRT treatments, TBI, or IMRT require different tests and/or tolerances. Some older machines may be upgraded (MLCs, portal vision) in order to perform IMRT or stereotactic radiotherapy. This will change the machine category for testing requirements. Solid compensator based IMRT is an option for some machines that are not IMRT capable. Many of the mechanical and dosimetric tests that apply to IMRT machines will therefore be applied to these machines and in most cases, specific for the particular manufacturer.

And finally, this report does give recommendations in regards to imaging devices that are connected to the accelerator and with gating as the accelerators operation can be tied to the respiratory system's signals. This was necessary as safety, mechanical, and operational attributes of imaging and gating are tied to the accelerator.

II. QUALITY ASSURANCE OF MEDICAL ACCELARATORS

II.A. General

The recommendations of this report are summarized in six tables. The first three tables, Table I (daily), Table II (monthly), and Table III (annual), essentially replace Table II of TG-40. However, as is evident, the scope of testing and the number of variables have increased compared to TG-40. Each table has specific recommendations based on the nature of the treatments delivered on the individual machine. The tables are differentiated into non-IMRT or nonstereotactic machines, IMRT machines, and IMRT/stereotactic machines. There are also explicit recommendations based on the equipment manufacturer as a result of the design characteristics of those machines. The recommendations in each table utilize the QA categories used in Table II of TG-40, dosimetry, mechanical, and safety, while adding a new category: Respiratory gating. The tests for asymmetric jaws and TBI/total skin electron therapy (TSET) are contained in Tables II and III. Three additional tables were created for dynamic/virtual/universal wedges (Table IV), MLC (Table V), and imaging (Table VI). All of these ancillary devices not covered in TG-40 are discussed in Sec. II D. Test frequencies for each test are listed in the tables and the rationale for them is dis-

TABLE II. Monthly.

Procedure	Machine-type tolerance		
	Non-IMRT	IMRT	SRS/SBRT
Dosimetry			
X-ray output constancy Electron output constancy Backup monitor chamber constancy		2%	
Typical dose rate[a] output constancy	NA	2% (@ IMRT dose rate)	2% (@ stereo dose rate, MU)
Photon beam profile constancy		1%	
Electron beam profile constancy		1%	
Electron beam energy constancy		2%/2 mm	
Mechanical			
Light/radiation field coincidence[b]		2 mm or 1% on a side	
Light/radiation field coincidence[b] (asymmetric)		1 mm or 1% on a side	
Distance check device for lasers compared with front pointer		1mm	
Gantry/collimator angle indicators (@ cardinal angles) (digital only)		1.0°	
Accessory trays (i.e., port film graticle tray)		2 mm	
Jaw position indicators (symmetric)[c]		2 mm	
Jaw position indicators (asymmetric)[d]		1 mm	
Cross-hair centering (walkout)		1 mm	
Treatment couch position indicators[e]	2 mm/1°	2 mm/1°	1 mm/0.5°
Wedge placement accuracy		2 mm	
Compensator placement accuracy[f]		1 mm	
Latching of wedges, blocking tray[g]		Functional	
Localizing lasers	±2 mm	±1 mm	< ±1 mm
Safety			
Laser guard-interlock test		Functional	
Respiratory gating			
Beam output constancy		2%	
Phase, amplitude beam control		Functional	
In-room respiratory monitoring system		Functional	
Gating interlock		Functional	

[a]Dose monitoring as a function of dose rate.
[b]Light/radiation field coincidence need only be checked monthly if light field is used for clinical setups.
[c]Tolerance is summation of total for each width or length.
[d]Asymmetric jaws should be checked at settings of 0.0 and 10.0.
[e]Lateral, longitudinal, and rotational.
[f]Compensator based IMRT (solid compensators) require a quantitative value for tray position (wedge or blocking tray slot) set at a maximum deviation of 1.0 mm from the center of the compensator tray mount and the cross hairs.
[g]Check at collimator/gantry angle combination that places the latch toward the floor.

cussed in Sec. II C. This task group (TG) considers that all of the tests included in the tables are important for ensuring the equipment to be suitable for high quality and safe radiation treatments. For example, in reference to physical wedge placement accuracy, Table II notes a monthly placement test with an accuracy of 2 mm. Deviations greater than 2 mm could result in errors as much as 2% at clinically relevant depths.

A *consistent beam profile* is an important quantity for accurate and reproducible dose delivery in radiotherapy. *Beam uniformity* was addressed in TG-40 Table II with flatness constancy, i.e., consistent flatness and symmetry tolerance levels. Constancy is specifically associated with flatness; however, symmetry tolerance can be interpreted as either absolute, regardless of reflection reference, or as constant values, taking into account the reflection reference, i.e., left to right or right to left. We believe this needs further interpretation in order to detect excessive changes in relative symmetry via sign change that would still fall within the tolerance of absolute symmetry value. For example, a cross-plane right/left symmetry drift from +3% to −3% is within the tolerance of TG-40 Table II but constitutes a beam shape change of 6%. Therefore, the monthly and annual tolerance values have been edited to take this into account and still

TABLE III. Annual.

Procedure	Machine-type tolerance		
	Non-IMRT	IMRT	SRS/SBRT
Dosimetry			
X-ray flatness change from baseline		1%	
X-ray symmetry change from baseline		±1%	
Electron flatness change from baseline		1%	
Electron symmetry change from baseline		±1%	
SRS arc rotation mode (range: 0.5–10 MU/deg)	NA	NA	Monitor units set vs delivered: 1.0 MU or 2% (whichever is greater) Gantry arc set vs delivered: 1.0° or 2% (whichever is greater)
X-ray/electron output calibration (TG-51)		±1% (absolute)	
Spot check of field size dependent output factors for x ray (two or more FSs)		2% for field size $<4\times4$ cm^2, 1% $\geq4\times4$ cm^2	
Output factors for electron applicators (spot check of one applicator/energy)		±2% from baseline	
X-ray beam quality (PDD_{10} or TMR_{10}^{20})		±1% from baseline	
Electron beam quality (R_{50})		±1 mm	
Physical wedge transmission factor constancy		±2%	
X-ray monitor unit linearity (output constancy)	±2% ≥5 MU	±5% (2–4 MU), ±2% ≥5 MU	±5% (2–4 MU), ±2% ≥5 MU
Electron monitor unit linearity (output constancy)		±2% ≥5 MU	
X-ray output constancy vs dose rate		±2% from baseline	
X-ray output constancy vs gantry angle		±1% from baseline	
Electron output constancy vs gantry angle		±1% from baseline	
Electron and x-ray off-axis factor constancy vs gantry angle		±1% from baseline	
Arc mode (expected MU, degrees)		±1% from baseline	
TBI/TSET mode		Functional	
PDD or TMR and OAF constancy		1% (TBI) or 1 mm PDD shift (TSET) from baseline	
TBI/TSET output calibration		2% from baseline	
TBI/TSET accessories		2% from baseline	
Mechanical			
Collimator rotation isocenter		±1 mm from baseline	
Gantry rotation isocenter		±1 mm from baseline	
Couch rotation isocenter		±1 mm from baseline	
Electron applicator interlocks		Functional	
Coincidence of radiation and mechanical isocenter	±2 mm from baseline	±2 mm from baseline	±1 mm from baseline
Table top sag		2 mm from baseline	
Table angle		1°	
Table travel maximum range movement in all directions		±2 mm	
Stereotactic accessories, lockouts, etc.	NA	NA	Functional
Safety			
Follow manufacturer's test procedures		Functional	
Respiratory gating			
Beam energy constancy		2%	
Temporal accuracy of phase/amplitude gate on		100 ms of expected	
Calibration of surrogate for respiratory phase/amplitude		100 ms of expected	
Interlock testing		Functional	

TABLE IV. Dynamic/universal/virtual wedges.

Dynamic-including EDW (Varian), virtual (Siemens), universal (Elekta) wedge quality assurance				
		Tolerance		
Frequency	Procedure	Dynamic	Universal	Virtual
Daily	Morning check-out run for one angle		Functional	
Monthly	Wedge factor for all energies	C.A. axis 45° or 60° WF (within 2%)[a]	C.A. axis 45° or 60° WF (within 2%)[a]	5% from unity, otherwise 2%
Annual	Check of wedge angle for 60°, full field and spot check for intermediate angle, field size	Check of off-center ratios @ 80% field width @ 10 cm to be within 2%		

[a]Recommendation to check 45° if angles other than 60° are used.

maintain the TG-40 intent. The tolerance values are also stated such that new developments in treating beams without flattening filters are considered.

In our updated tolerance table, the monthly tolerance values are specific to a consistent beam shape, where baseline off-axis factors (OAFs) were measured with a QA device immediately following beam commissioning or updated by the annual review. Ongoing QA measurements are compared to the baseline off-axis factors. Chosen point locations that fall within the core of the field [as an example four points off axis in multiple directions within 80% of an agreed upon field size (FS)] should have an average of their absolute values within the tolerance value in Table II. This is expressed as

$$\frac{1}{N}\cdot\sum_{L=1}^{N}\left|\frac{\mathrm{TP}_L-\mathrm{BP}_L}{\mathrm{BP}_L}\right|\cdot 100\% \le \text{tolerance}\%,$$

where TP_L and BP_L are off-axis ratios at test and baseline points, respectively, at off-axis point L, N is the number of off-axis points, and $\mathrm{TP}_L=(\mathrm{MP}_L/\mathrm{MP}_C)$ where M represents the measurement value and C is the central axis measurement. Similarly, the baseline points are represented by $\mathrm{BP}_L=(\mathrm{MBP}_L/\mathrm{MBP}_C)$

The annual table in TG-40 included a 2% tolerance for "off-axis factor constancy," with recommended testing at various gantry angles, but there was no mention of flatness or symmetry. We have added this as a profile comparison to baseline commissioning data in a large field size; this increases the sensitivity to detect beam shape changes that result from a beam energy change or target change that may be due to long term aging effects. The recommended field size is 30×30 cm^2 or greater for conventional x rays; the largest field size for special x-ray applications if $<30\times30$ cm^2 and the largest applicator for electrons. The flatness and symmetry values in the center 80% FS of the measured profile, as defined during machine commissioning, should not deviate from the baseline by more than the tolerance values in Table III. We believe that this test expansion is justified since the

TABLE V. Multileaf collimation (with differentiation of IMRT vs non-IMRT machines).

Procedure	Tolerance
Weekly (IMRT machines)	
Qualitative test (i.e., matched segments, aka "picket fence")	Visual inspection for discernable deviations such as an increase in interleaf transmission
Monthly	
Setting vs radiation field for two patterns (non-IMRT)	2 mm
Backup diaphragm settings (Elekta only)	2 mm
Travel speed (IMRT)	Loss of leaf speed >0.5 cm/s
Leaf position accuracy (IMRT)	1 mm for leaf positions of an IMRT field for four cardinal gantry angles. (*Picket fence* test may be used, test depends on clinical planning-segment size)
Annually	
MLC transmission (average of leaf and interleaf transmission), all energies	±0.5% from baseline
Leaf position repeatability	±1.0 mm
MLC spoke shot	≤1.0 mm radius
Coincidence of light field and x-ray field (all energies)	±2.0 mm
Segmental IMRT (step and shoot) test	<0.35 cm max. error RMS, 95% of error counts <0.35 cm
Moving window IMRT (four cardinal gantry angles)	<0.35 cm max. error RMS, 95% of error counts <0.35 cm

TABLE VI. Imaging.

Procedure	Application-type tolerance: non-SRS/SBRT	Application-type tolerance: SRS/SBRT
Daily[a]		
Planar kV and MV (EPID) imaging		
Collision interlocks	Functional	Functional
Positioning/repositioning	≤2 mm	≤1 mm
Imaging and treatment coordinate coincidence (single gantry angle)	≤2 mm	≤1 mm
Cone-beam CT (kV and MV)		
Collision interlocks	Functional	Functional
Imaging and treatment coordinate coincidence	≤2 mm	≤1 mm
Positioning/repositioning	≤1 mm	≤1 mm
Monthly		
Planar MV imaging (EPID)		
Imaging and treatment coordinate coincidence (four cardinal angles)	≤2 mm	≤1 mm
Scaling[b]	≤2 mm	≤2 mm
Spatial resolution	Baseline[c]	Baseline
Contrast	Baseline	Baseline
Uniformity and noise	Baseline	Baseline
Planar kV imaging[d]		
Imaging and treatment coordinate coincidence (four cardinal angles)	≤2 mm	≤1 mm
Scaling	≤2 mm	≤1 mm
Spatial resolution	Baseline	Baseline
Contrast	Baseline	Baseline
Uniformity and noise	Baseline	Baseline
Cone-beam CT (kV and MV)		
Geometric distortion	≤2 mm	≤1 mm
Spatial resolution	Baseline	Baseline
Contrast	Baseline	Baseline
HU constancy	Baseline	Baseline
Uniformity and noise	Baseline	Baseline
Annual (A)		
Planar MV imaging (EPID)		
Full range of travel SDD	±5 mm	±5 mm
Imaging dose[e]	Baseline	Baseline
Planar kV imaging		
Beam quality/energy	Baseline	Baseline
Imaging dose	Baseline	Baseline
Cone-beam CT (kV and MV)		
Imaging dose	Baseline	Baseline

[a]Or at a minimum when devices are to be used during treatment day.
[b]Scaling measured at SSD typically used for imaging.
[c]Baseline means that the measured data are consistent with or better than ATP data.
[d]kV imaging refers to both 2D fluoroscopic and radiographic imaging.
[e]Imaging dose to be reported as effective dose for measured doses per TG 75[36].

annual test is more comprehensive, intended to uncover changes that may have remained undetected during more frequent but less rigorous testing throughout the year. Note that the tolerance value is not absolute in that it should not be interpreted as a comparison to the machine specification; instead it is a tolerance value from the baseline. The expansion of tests is also justifiable due to the fact that since TG-40 and post-IMRT, the selection of available QA tools makes annual testing less burdensome; these tools range from 3D water scanning tanks to large area detector arrays. The proper tools should be chosen by matching the detectors and software to the needs and sensitivity requirements.

II.B. Test frequencies

As with TG-40, testing is distributed among daily, monthly, and annual QA frequencies. The underlying principles for test frequency follow those of TG-40 and attempt to balance cost and effort with accuracy. In this report there are additional factors that affect the frequency of the tests, specifically the type of treatments delivered on the machine and the inherent design of the machine. For example, some linacs are designed with independent photon and electron monitor chamber systems (e.g., Siemens). It is recommended that each independent monitor chamber system should be checked daily.

The daily (or in some cases weekly) tests include parameters that can affect dose to the patient by dosimetric (output constancy) or geometric (lasers, optical distance indicator, field size) means. The daily safety tests still include audiovisual monitoring of the patient and testing of the door interlock. With respect to EPID and kV imaging, the operation and functionality are tested daily, as well as collision interlocks. The daily tests are typically performed by the morning warm-up therapist, who should be trained by a qualified medical physicist with a well defined policy and procedure to follow if any of the tests are found to be out of tolerance. Monthly tests include those that have a lower likelihood of changing over a month (e.g., tray position or profile consistency—which also serves as an energy check for photons). Monthly tests for respiratory gating have been added as well as more quantitative tests for EPIDs and kV imaging. These tests are typically more involved and are generally performed by the QMP. The annual tests are a subset of the tests performed during acceptance testing and commissioning procedures. During the annual review of dosimetry systems, constancy factors are either established, reconfirmed, or updated.

Several authors have attempted to develop a systematic approach to developing QA frequencies and action levels.[37–39] More recently the work being performed by Task Group 100[40] of the AAPM. TG 100—A method for evaluating QA needs in radiation therapy [based on "Failure modes and effects analysis (FMEA)"]—promotes individual departments to be responsible for development of unique QA programs based on procedures and resources performed at individual institutions. Institutional deviations from some of these recommendations are expected based upon the institution's policy and procedures; the clinical significance of these deviations may be mitigated by other control methods that are not anticipated in this document. In the case of decreasing the frequency of a particular test, the results of the test must be examined and be validated with an appreciable history of that test and based on sound statistical principles. That decision must also be correlated with the documented analysis of the potential impact of catastrophic results in the event of an occurrence. By FMEA analysis, an institution can estimate the degree of harm due to a failure along with (lack of) detection and occurrence probabilities. We reiterate the recommendations of TG-40[1] that the QA program should be flexible enough to take into account quality, costs, equipment condition, available test equipment, and institutional needs. However, we do recommend using the tests and frequencies outlined in the tables that follow until methods such as TG-100 supersede this report.

II.C. Guidelines for tolerance values

The original tolerance values in TG-40 were adapted from AAPM Report 13. Report 13 used the method of quadratic summation to set tolerance values for individual machine parameters. These values were intended to make it possible to achieve an overall dosimetric uncertainty of $\pm 5\%$ and an overall spatial uncertainty of ± 5 mm. These tolerances are further refined in this report and those quoted in the tables are specific to the type of treatments delivered with the treatment unit. For example, the coincidence of collimator, gantry, and couch axes with the isocenter is recommended to be within 1 mm for a stereotactic machine and within 2 mm for other machines.

To clarify the relationship of tolerance values with variations from dosimetric baseline values or deviations from absolute mechanical values established during acceptance testing, we provide the following definitions.

II.C.1. Acceptance testing procedure standards

During the process of acceptance of equipment the supplier demonstrates its performance to the satisfaction of the customer against specifications, which should be part of the agreed contract. The dosimetric and mechanical measurements should satisfy the agreed upon specification values. Acceptance testing and commissioning set the *baseline* for future dosimetric measurements for beam performance *constancy* and verifies that the equipment is mechanically functional and operates within certain tolerances from absolute specified values.

II.C.2. Commissioning baseline values

Upon acceptance of the equipment, treatment beam characteristics needed for clinical use are established by the commissioning process. Often some of the beam characteristics may have been already acquired during the acceptance testing procedures. These beam characteristics establish the baseline values to be checked relative to constancy during future dosimetric quality assurance measurements.

II.C.3. Tolerances and action levels

The spirit and intent of TG 40 are maintained and further clarified; the tolerances listed in the tables should be interpreted to mean that if either a baseline parameter measured during AT exceeds the tabulated value or the change in the baseline parameter exceeds the tabulated value, then an action is required. Therefore, if ongoing QA measurements fall outside the tolerance levels (allowed deviation) in the tables, the equipment should be adjusted to bring the measured values back into compliance: the tolerances are action levels [a hierarchy of steps taken by the medical physicist (MP) and QA staff]. However, if certain baseline parameters barely satisfy the tolerance value repeatedly, an appropriate action should be taken to correct the equipment. These actions should be set by the MP in terms of the level of action (inspection, scheduled, or immediate stoppage) to be taken and under what circumstances. The actions should be well known by all personnel involved in the QA process.

It is not our intention to make prescriptive recommendations on the type of action but rather provide guidance as to the types of actions that are needed in the QA process. We believe there are three types of actions, with an action priority ranking from lowest to highest, as follows.

- Level 1: Inspection action. From repeated QA procedures, there are measurement values that become expected under normal operating conditions. A sudden and significant deviation from the expected value should be called to the attention of the MP, even if the measurement itself does not exceed the table tolerance value. Some measured values may be affected due to intervention outside of the normal linac operation or measurement. For example, a change in personnel, setup, or maintenance event may cause a measurement shift. The change may also be indicative of a machine problem that is not yet out of tolerance QA but a change nonetheless. Treatments should continue, but the cause should be investigated during routine QA.
- Level 2: Scheduled action. We present two examples which could require scheduled action. First, consecutive results of a QA procedure that are at or near the tolerance value should cause investigation or scheduled maintenance into the problem within one to two working days. Second, a single result that exceeds the tolerance value, but not excessively, should cause investigation or scheduled maintenance. Under these conditions, deviations may slightly exceed the tolerance, but the clinical impact over the course of a few days (<1 week) may not be significant. Treatment may continue, but mitigation of the cause should be scheduled to take place within one to two working days.
- Level 3: Immediate action or stop treatment action or corrective action. A measurement result could require an immediate suspension of the treatment function related to the dosimetric parameter measured. Examples for complete suspended use of the linear accelerator could be as simple as nonfunctional safety interlocks or as extreme as an excessive error in a dosimetry parameter. Specified treatment functions should not continue until the problem is corrected.

With these three action levels, there is an institutional need to specify the deviations from baseline values and tolerances associated with levels 2 and 3. This should be carried out by the QA committee as discussed in the TG-40 report (Sec. B.I.C). The level 1 parameters' thresholds cannot be specified by the committee; these thresholds evolve from the QA data. The level 1 threshold is not a critical requirement but it can lead to significant improvements in the QA program. The report from TG-100 is expected to address some of these issues.

II.C.4. Uncertainties, repeatability, and precision

The TG-40 report[1] stated that test procedures should be capable of distinguishing parameter changes that are smaller than tolerance or action levels. Here we attempt to further clarify this requirement and offer some examples. There is an associated measurement uncertainty that depends upon the technique used, the measuring device, and the person using the device and recording the measurement.

- Measurement uncertainty (or accuracy) is in reference to an expected error of the measurement result with respect to a defined standard (baseline value).
- Measurement repeatability is in reference to the device's measurement statistics, i.e., with no change in the quantity being measured and no change in the measurement setup, the recorded values from repeated measurements will have a standard deviation about the mean.
- Measurement precision is in reference to the measuring device's scale resolution of the display.

For example, a dosimetry chamber/electrometer may have a measurement precision of 0.01% on a full scale four digit display, measurement repeatability with a deviation of the mean of 0.05% after ten repeated measurements, and a measurement uncertainty of 1.5% absolute dose. Many of the tolerance values in the tables are with respect to baseline values from the QA measuring device, measured at the time of commissioning. The measurement repeatability of the device and technique must be less than the tolerance level for the parameter being measured. We recommend that the measurement system and procedure repeatability be such that two standard deviations for three or more repeated consecutive measurements are less than the tolerance value.

The tolerance values in the tables have an interdependence with test frequency. Devices used for daily QA output constancy may provide data for tests normally performed on a monthly basis. However, the monthly tests are expected to be performed at a higher level of skill and with a higher level of test equipment and therefore those measurements carry a tighter tolerance value. Therefore, when a procedure is performed on a more frequent schedule than required, the QA committee may include the more frequent measurements with a different tolerance value as listed in this report's tables. This will become apparent when establishing the level

1 action level. However, the tolerance values in this report should be rigorously maintained for the specified procedure frequency.

II.D. Ancillary treatment devices not in TG-40

The AAPM TG-40 report made it clear that new devices coming on-line during this time period (1994) would be beyond the scope of the report. The TG-40 report did not address asymmetric jaws, dynamic/virtual wedging, or multileaf collimation. However, task groups addressing each of these new technologies never formed, or the final reports were written after TG-40 was published, for example, the multileaf collimation TG-50[41] report. Klein *et al.*[15] published a manuscript on a QA program for ancillary high technology devices on a dual-energy linear accelerator that included asymmetric jaws, dynamic and virtual wedges, multileaf collimation, and electronic portal imaging. This paper was based on one institution's equipment and process for QA. In addition, the technologies themselves have manifested into more modern and complicated devices, especially the use of multileaf collimation for IMRT.

This section addresses these ancillary devices/options in terms of QA processes required to support them. We have incorporated asymmetric jaws within the revised Table II (TG-40) recommendations, while separate tables have been created for MLC and dynamic/virtual wedges. This task group makes specific recommendations for asymmetric jaws, jaw based wedge delivery systems, and multileaf collimation that are both vendor specific and operation specific. This was necessary due to the differences among the systems. The following sections outline these specific recommendations.

II.D.1. Asymmetric jaws

Slessinger *et al.*[42] published one of the earliest papers on implementation of asymmetric jaws including calculation schemes and QA. For asymmetric jaws, there should be additional scrutiny for beam matching and the accuracy of dynamic/virtual wedge delivery which depends strongly on jaw positioning accuracy. For example, Klein *et al.*[43] published a paper using a single isocentric technique relying on asymmetric jaws with beam matching at the isocentric plane for breast irradiation. To address this, the recommendation was to perform monthly light-radiation coincidence and asymmetric jaw positional accuracy for each jaw used clinically at 0.0 cm (for beam matching) and also at 10.0 cm (retracted from central axis). The testing of the jaws positioned at 0.0 can be performed with a single film to demonstrate nondivergent field matching.

II.D.2. Dynamic/virtual/universal wedge

Before IMRT, modulation of the beam during treatment was accomplished by computer controlled movement of the collimating jaw while the beam was on using computer control.[44] These technologies, dynamic (later enhanced dynamic wedge) and virtual wedges, were clinically introduced by Varian and Siemens, respectively. Jaw accuracy for the dynamic wedge-type delivery published by Klein *et al.*[45] showed that very small changes in jaw position could affect the dynamic wedge factor. The dynamic wedge reports (Klein,[15] Liu,[46,47] and Beavis[48]) all pointed to individual institution recommendations for dynamic jaw delivery to deliver a wedge field. Zhu *et al.*[49] published similar recommendations for virtual wedge. As these technologies rely on computer delivery of jaw position in a given instant or percentage of monitor units (MUs), there should be scrutiny of the embedded tables that map the location of jaw position in relationship to time (fraction of MU to be delivered). In this report, we include the Elekta universal wedge within this category (described by Phillips *et al.*[50]), as computer control moves the fixed internal 60° wedge in place to yield an effective wedge angle when combined with an open field. The recommendations in Table IV include some simple daily systematic tests, operational tests of the computer control on a monthly basis, and annual dosimetric tests. We recommend that tests be performed with a 45° wedge delivery for systems that deliver an "effective" wedge angle by using a combination of 60° and open beam. If, however, a facility opts to deliver a 60° wedge as a unique field, then the 60° wedge angle should be checked.

II.D.3. MLC

Early implementations of multileaf collimation[51–53] were limited to tests and tolerance recommendations for early Varian MLC machines. Soon afterward, Jordan and Williams[54] published a paper for Elekta machines and Das *et al.*[55] for Siemens machines. Mubata *et al.*[21] published a paper dedicated to QA for Varian machines following these initial papers. In 1998, the AAPM formed a task group (AAPM TG-50[41]) to address multileaf collimation, including extensive sections on multileaf collimator QA. This publication recommended a scope limited QA program. Although the task group report was published during initial IMRT implementations using multileaf collimation, it did not make recommendations specific for MLCs as used for IMRT. Subsequent publications,[9,30,56–61] particularly those by Cosgrove *et al.*[62] and Chang *et al.*,[63] pointed to tests for MLC QA along with tools for such tests. We have subsequently recommended testing (Table V) that depends on whether or not the MLC system is used for IMRT. With regards to the impact of MLC on IMRT, publications have documented the impact of leaf positioning accuracy and interleaf or abutted leaf transmission on the accuracy of delivered IMRT fields.[64–66] Therefore additional tests of multileaf collimators that are used for IMRT are recommended. Some of the leaf parameters that affect dose delivery for IMRT include leaf positional accuracy and transmission values. Simple tests, such as the picket fence test described by LoSasso,[66] can assess positional accuracy qualitatively (by the matching of sequential segments and leaf transmission, particularly interleaf). We recommend the picket fence test be performed weekly with a careful examination of the image acquired by static film or on-line portal image. On a monthly basis, we recommend expansion of the leaf position accuracy test to account

for gantry rotation which may affect leaf motion due to gravitational effects imposed on the leaf carriage system. Loss of travel speed can result in increased beam holds or gap width errors.[66] MLC travel speed is evaluated with vendor software or by MLC log file evaluation. As an example, Varian offers a tool for such analysis.[67,68] The software takes data and creates a series of tables and plots, specifically an error histogram showing all the leaf position deviations, error RMS showing the calculated root mean square error for leaf deviations, and beam hold off and beam on plots. As per manufacturer specifications, the error histogram is deemed acceptable if 95% of the leaf deviations are less than 0.35 cm and the maximum error RMS for either carriage is less than 0.35 cm. We have incorporated use of this analysis in Table V for multileaf collimation for Varian MLCs and recommend repeating the customer acceptance test procedures on an annual basis. Similar types of analysis software can be developed for other systems if the leaf and time dependent data can be extracted.

On an annual basis we recommend enhancing the transmission test to include quantitative analysis of the leaf transmission. Recent development of tools utilizing EPID devices allow for subpixel precision to detect changes in discrete locations of an acquired image.[69,70] As treatment planning parametrization seeks a global value for leaf transmission, it is important that the leaf body, side, and end characteristics do not change over time, the most vulnerable being the leaf side rigidity due to leaf inderdigitation, as it may affect interleaf leakage, hence the close attention needed. Leaf position repeatability, MLC spoke shot, and coincidence of light field and x-ray field all are tests intended to check the alignment of the MLCs. Vendor-specific tests are also recommended depending on the model of MLC used. Each vendor has unique preventative maintenance program recommendations and therefore replacement of MLC motors and leaves may vary in frequency. Therefore physicists must be aware of the replacement schedule as post-testing is required. All tests should reflect the types of treatments delivered in the department. The method of testing (film, solid state detectors, software, EPID) shall be sensitive enough to detect errors less than the tolerance level and have the ability to analyze all MLC leaves.

II.D.4. TBI/TSET

For either TBI or TSET QA tests chosen by a qualified medical physicist are a subset of the commissioning data sufficient to assure continued proper operation of the accelerator. QA tests should replicate test conditions performed during the commissioning of the technique. *In vivo* patient-specific dosimetry should be considered for both TBI and TSET.

TBI requires very large treatment fields to encompass the entirety of the patient. Some health care facilities have treatment units specifically designed for total body irradiation, but it is more common for conventional radiotherapy linear accelerators to be used. AAPM Report 17 [71] is a general reference describing TBI techniques. Report 17 describes phantom and patient dosimetry considerations for TBI. It is common for the linear accelerator to operate in a special dose rate mode for TBI treatment. The treatment distance is normally much greater than the standard 100 cm source-to-axis distance (SAD). TBI beam modifiers may be employed. Thus, measurements at extended distance with the accelerator in the TBI mode and with TBI modifiers must be made when this modality is commissioned. Table III recommends annual tests of TBI modifiers' transmission constancy if used, tissue-phantom ratio (TPR), OAF constancy, and measurement of output constancy (±2%) in the TBI mode for the clinical MU range at clinical dose rates (MU/min). Measurement at two depths is sufficient for confirmation of beam energy, and a limited number of off-axis measurements suffice for confirmation of OAFs. Some accelerators operate in a special TBI mode that has identical operating parameters as the normal non-TBI mode. In this case, annual measurements of the beam energy [percentage-depth dose (PDD) or TMR] and beam profile (OAF) at the isocenter are sufficient.

TSET is a specialized electron beam technique normally at energies from 3 to 7 MeV at the patient. TSET is described in detail in an AAPM Task Group Report.[72] This report describes irradiation techniques for TSET as well as dosimetric considerations specific to the technique. The linear accelerator operating parameters, such as dose rate, collimating device, and perhaps the beam scatterer, differ for TSET from standard electron beam operating parameters. QA tests should replicate test conditions done during the commissioning of the technique. Table III recommends annual tests of TSET modifiers' transmission constancy if used, PDD or other energy check, OAF constancy, and measurement of output constancy in the TSET mode for the clinical MU range. Measurement at two depths is sufficient for confirmation of beam energy, and a limited number of off-axis measurements suffice for confirmation of OAFs.

II.D.5. Radiographic imaging

This section covers radiographic imaging systems commonly integrated with medical accelerators: Megavoltage (MV) planar imaging, kV planar imaging, and MV or kV computed tomographic imaging (both serial and cone beam). Table VI contains QA recommendations for the imaging systems. Each radiographic imaging device, either 2D or 3D, has its own geometric coordinate system, similar to the delivery system. Even for the 2D portal imaging device which uses the treatment beam as the imaging source, the manual methods or software used to manipulate images could cause some discrepancies with treatment coordinates. Typically, the imaging coordinate system is correlated with the delivery coordinate system through a calibration process. It is, therefore, critical to ensure the coincidence of these two coordinate systems for different clinical needs of image-guided radiation therapy procedures. The QA item "imaging and treatment coordinate coincidence" is aimed to test this coincidence and is applicable for each of the imaging systems considered. In addition, each system performing patient positioning and/or repositioning based on in-room imaging sys-

tems, either 2D or 3D, relies upon vendor software that compares and registers on-board images and reference images. Quality assurance of this process could be easily done by a phantom study[73] with known shifts and is recommended for each system used clinically. The accuracy of this process should be tested on the daily basis, especially for SRS/SBRT.

Clinical use of kV imaging devices is being systematically summarized in TG104,[73] although there are no specific recommendations for the QA tolerances in that report. In this report, we set basic recommendations for the use of in-room kV imaging systems. The fundamental goals for kV imaging in radiation oncology target localization are different from those in diagnostic imaging. In radiation oncology there is greater emphasis on the localization accuracy. However, the localization accuracy is dependent on the visibility of the anatomic structures to be localized. Better image quality typically leads to better visibility of anatomical structures but is also proportional to higher imaging dose. It is understandable that the localization accuracy of some treatment sites (such as breast portals) may be less sensitive to image quality than others (such as head and neck). Therefore, it is critical to carefully balance the desire of image quality and imaging dose without compromising the localization accuracy. A variety of kV imaging systems was recently introduced. Applications of these kV imaging systems include 2D radiographic imaging, 2D fluoroscopic imaging, and 3D tomographic imaging as well as 4D imaging associated with organ motions. Acceptance testing criteria for each imaging system should be established between the manufacturer and the user. These acceptance testing criteria should include parameters related to safety, image quality, imaging dose, and localization accuracy. The baseline data (including both means and ranges or measured values and their upper and lower limits) established during the acceptance testing should be used for the QA criteria.

II.D.5.a. Planar MV imaging (portal imagers). Clinical use of electronic portal imaging devices has been addressed by TG58[74] and is described widely in the literature.[17,75–77] Recommended QA tests from the TG-58 report are incorporated in Table VI, though updated to account for on-board-imaging tests. However, details of the test contents, such as the dose rate to be checked for imaging quality, the energy, and the calibration distances, should be determined specifically for each type of EPID and for each individual institution. It is important to note that image quality checks (contrast, resolution, and noise) should be done for all calibration modes and energies to be used for imaging.

II.D.5.b. Planar kV imaging. The basic QA for planar kV imaging system mainly handles 2D x-ray imaging, either with radiographic imaging (single shot of a planar image) or continuous fluoroscopic imaging. Radiographic 2D imaging is very powerful in localizing bone structures and internal/implanted markers with higher density. It is also fast with negligible imaging dose. Fluoroscopic imaging is useful in monitoring organ motion but caution should be paid for imaging dose. The baseline data from acceptance testing are recommended as criteria for imaging quality QA. The user should maintain the image quality not poorer than those data. The criteria for the SRS/SBRT should be based on rigid-body phantom tests.

II.D.5.c. Serial and cone-beam CT. Basic recommendations for the QA of axial and CBCT systems, including both kV[78] and MV,[79] are found in Table VI. These tools are primarily used for target localization, which provides excellent soft tissue and volumetric information. In this report, serial CT should include both axial and helical CT and mainly refers to the CT-on-rail system. The positioning and repositioning accuracy should include couch movement from the treatment position to the imaging position. The QA for tomotherapy which uses helical serial MV CT, will be discussed in a separate AAPM report (TG-148). Although spatial accuracy of image reconstruction is paramount and most heavily emphasized, image quality parameters (e.g., contrast, noise, uniformity, and spatial resolution) are important aspects that should also be considered. Additionally, manufacturer's recommendations for imaging systems recalibration procedures should be followed unless the user has shown in extensive studies that the procedure frequency can be reduced. Since such imaging systems are often used daily and are capable of delivering significant radiation dose, a direct measure of imaging dose and beam quality/energy is recommended at least annually. As with the recommendations for kV imaging, the baseline data (including both means and ranges or measured values and their upper and lower limits) established during the acceptance testing should be used for QA criteria. Consistent with recommendations of TG-75[36] ("Management of imaging dose during IGRT"), the tolerance for variation of imaging dose and beam energy from baseline measurements identified during acceptance testing should be established such that the patient experiences clinically insignificant increases in stochastic and deterministic risk while maintaining image quality parameters. We believe that an annual review of imaging dose is sufficient due to minimal impact on overall dose and by virtue of existing daily/monthly reviews of many parameters that would detect changes that could potentially affect dose. For the Siemens MV CBCT the beam calibration parameters are typically very similar to the treatment beam, yet they are unique and independent, so the calibration of dose should be specifically checked for the MV CBCT beam. The frequency of measuring dose and beam quality/energy depends on the likely system stability and details of clinical utilization; for example, if the imaging dose is included in the treatment plan but represents $<10\%$ of the prescribed dose, a 20% variation in imaging dose will still only result in a 2% dose error. This report recommends annual assessment of imaging dose, which may be deemed to be required more frequently by the individual user based on clinical utilization and observed system stability.

II.D.6. Respiratory gating

Respiratory gating, at the time of the report, is an emerging technology. As such, QA methods will need to evolve in tandem with the technology. AAPM Report 91[80] (TG-76),

published in 2006, described all aspects of the management of respiratory motion in radiation oncology, including imaging, treatment planning, and radiation delivery. Various configurations and techniques for implementation of respiratory gating are described in TG-76. The TG-76 report also contains technology-specific QA recommendations. Though there are different avenues of implementation, all respiratory techniques fundamentally require a synchronization of the radiation beam with the patient's respiratory cycle. Characterization of the accelerator beam under respiratory gating conditions is done during commissioning of this modality. Dynamic phantoms which simulate human organ motions associated with respiration are recommended to test target localization and respiratory gated treatment accuracy. Tables II and III include tests for respiratory gated accelerator operation, including measurement of beam energy constancy, beam output constancy, temporal accuracy of phase/amplitude gating windows used, calibration of surrogate for respiratory phase/amplitude (detailed below), and interlock testing. One approach to performing these measurements was described by Bayouth *et al.*,[81] where gating windows from 250 to 1500 ms were considered. Beam energy and output constancy were quantified with a pair of ion chambers (10 and 20 cm depths) measuring simultaneously for each gated period; it was found that all dosimetric parameters were within $\pm 2\%$ for gating windows ≥ 500 ms on a Siemens accelerator. The relationship between temporal accuracy and phase/amplitude gate used was established by gated treatment delivery exposing the radio-opaque target attached to motion phantom, where the geometric center of a radio-opaque target was known at each phase/amplitude relative to the beam central axis. These images were acquired on radiographic film but could also be acquired on an EPID. Table III provides tolerance values to be verified during annual QA; the 100 ms tolerance for temporal accuracy assumes the moving object travels at speeds no greater than 20 mm/s, which would result in 2 mm of positional uncertainty. The QMP should maintain a tolerance consistent with spatial uncertainty values accounted for in the treatment planning process. Site-specific and technique-specific tests should be used to supplement these general recommendations. For example, several different types of surrogates of respiratory pattern may be used clinically (e.g., optical, strain-gauge belts with pressure sensors, and spirometry); the QMP should verify the phase and amplitude indicated by the surrogate do not change significantly over time as is relevant to how they are applied clinically. Calibration of the sensor for respiratory phase/amplitude, which has not been described in the literature, consists in validating constancy between a known location/movement of the surrogate and its response. An example test for the pressure sensor is placing a series of fixed weights on the sensor and determining the gain and offset values that produce a desired amplitude (e.g., 50%). For optical systems, this can be accomplished by placing a fiducially marked block (surrogate) at a series of fixed known locations within the field of view and comparing the reported displacements to the known values. Once spatial accuracy is confirmed, phase confirmation can be established with a periodic motion phantom.

III. SUMMARY OF RECOMMENDATIONS/ IMPLEMENTATION SCHEME

The tabulated items of this report have been considerably expanded as compared with the original TG 40 report[1] and the recommended tolerances accommodate differences in the intended use of the machine functionality (non-IMRT, IMRT, and stereotactic delivery).

(1) It is recommended that a departmental QA team be formed to support all the QA activities and draft necessary policies and procedures. These policies and procedures should be readily available to all members of the departmental QA team on hard copy and online. The policy should establish the roles and responsibilities of involved QA personnel. For QA measurements, detailed instructions on equipment use, cross calibration of these devices, measurement frequency, and documentation of the results should be provided. In case of suspected malfunction of the equipment, policies and procedures should also provide alternative methods for measurement.

(2) The first step in implementing the recommendations is to establish institution-specific baseline and absolute reference values for all QA measurements. The QA team needs to meet regularly and monitor the measurement results against the established values to (1) ensure the machine performance and (2) determine any significant dose deviations from the treatment planning calculations. There are many commercially available QA devices that could be used for daily, weekly, and monthly QA. The manufactures of these devices supply descriptive procedures that guide the user in utilizing these QA devices correctly. It is recommended that such devices be checked for accuracy and consistent performance prior to use for any specific QA procedures based on the manufacturer guidelines. These devices should also be evaluated for proper use and appropriateness of the particular QA test.

(3) A QMP should lead the QA team. It should be her/his responsibility to provide adequate training of the other team members, such as the therapists and the dosimetrists, so that they clearly understand and follow policies and procedures. For example, training on the operation of the QA equipment may cover appropriate warm-up period, how to interpret the measured data, what to do when tolerance levels are exceeded, etc. It is recommended that the QMP provide the proper action level and methods of notification in the case tolerances are exceeded.

(4) In general, the daily QA tasks may be carried out by a radiation therapist using a cross-calibrated dosimetry system. For such tasks, we recommend using robust and easy-to-setup equipment. For example, a plastic phantom cube with a thimble ionization chamber insert may

be used for the checking output constancy. In most cases, the flat edge and the surface of the phantom can be also used to check the alignment of in-room lasers. Commercial flat-panel multidetector arrays with appropriate buildup material may be also used for daily QA. The advantage of such equipment is that it allows efficient check of other beam parameters such as the flatness and symmetry without repeated setup of the equipment. Due to frequent use of the daily QA equipment, correction factors influencing the detector response should be carefully documented. These may include temperature and pressure correction factors for a vented chamber, electrometer calibration factors, leakage corrections, etc. All results should be documented in either a permanent electronic or hardcopy format and should be readily available for inspection purposes. There should be clear guidelines for the personnel performing the tests as to the appropriate action to take if a test is out of tolerance. These guidelines would generally include notifying a physicist. In addition, the QMP should review and sign off on the reports at a minimum of once per month.

(5) Monthly QA tasks should be performed by a QMP or by individuals directly supervised by a QMP. It is recognized that there is overlap on some test items for daily, monthly, and annual. This overlap in frequency should have some level of independence such that the monthly check would not simply be a daily check. This can be achieved with independent measurement devices, but the full extent of monthly independence from the daily measurements is decided upon by the QMP. This involvement should include validation of devices through redundant measurements and validation of the daily process by examination of the records. For example, if a multidetector array is used for the daily output measurement and the monthly dosimetry measurements use the same multidetector array, then an ionization chamber with a phantom should be compared with the output measurement of the array on an annual basis, including reference to past baseline values. This provides confidence in the daily device and will identify trends that may otherwise go undetected over the course of a long period of time such as 1 year. Such comparison enables effective use of minimal equipment in institutions with limited resources. As for the daily QA tasks, all results should be documented in either a permanent electronic or hardcopy format and should be readily available for inspection purposes. It is important for the physicist to cross calibrate any equipment used with equivalent or surrogate systems. There should be clear guidelines for the personnel performing the tests as to the appropriate action to take if a test is out of tolerance. These guidelines would generally include secondary checks and notification to the QMP. In addition, the QMP should review and sign off on the reports within 15 days of completion.

(6) The annual QA items in the report represent the most extensive tests on the machine performance. These checks are sometimes adopted by the city or state regulatory agencies to ensure adequate functionality of the linear accelerators for patient and environmental safety concerns. For this reason, it is recommended that the annual measurements be performed by a QMP with involvement of other QA team members. It is highly recommended that QA devices and equipment, such as ionization chambers and water scanning tank, should be adequately checked prior to any measurements. The measurements should be carried out using commissioning quality equipment as recommended by the forthcoming AAPM TG-106 report.[7]

(7) An end-to-end system check is recommended to ensure the fidelity of overall system delivery whenever a new or revised procedure is introduced. This can be done by creating a set of sample treatment plans typical of the facility's clinical caseload, transferring the plan data across the data network, and delivering them at the treatment machine. If the record and verify (R&V) system is a conduit for data, it must be included in the end-to-end testing. End-to-end tests are necessary whenever software changes occur with the treatment planning software, R&V software, or delivery system software. In particular, point dose measurements should be performed for treatment plans to ensure constancy between the dose calculation and the treatment delivery process. These end-to-end tests should be documented for the life of the various system components.

(8) During the annual QA review, absolute machine output should be calibrated as per the TG51 calibration protocol[82] using an ionization chamber with a NIST traceable calibration factor. Once the machine output has been calibrated, all secondary QA dosimeters including the daily QA and the monthly QA devices should be cross-checked against such calibrations. Although our report did not make specific recommendations regarding independent acceptance tests for a new machine, we promote the use of the annual QA tests recommended by this report to be used as a general guide when reviewing vendor-specific acceptance tests and tolerance values.

Upon completion of the measurements, it is recommended that an annual QA report be generated. The report should state significant findings based on the recommended table tolerance values. The report can be similarly divided into sections that include (1) dosimetry, (2) mechanical, (3) safety, (4) imaging, and (5) special devices/procedures. The QA report should be signed and reviewed by the QMP and filed for future machine maintenance and inspection needs.

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21ST CENTURY ONCOLOGY

TQM MANUAL TABLE OF CONTENTS

SECTION 4:

a. Dress Code
b. Continuing Education
c. Technologist Professional Credential Policy
d. Medical Support Professional Credentials Policy

SECTION 5:

a. Front Desk Responsibilities
b. Policy and Procedure to Verify Patients Receive Status Checks
c. Front Desk Status Check Guide
d. Registering a VIP With an Alias
e. Policy and Procedure on Self-Referral Patients
f. Instructions on Adding a Patient in Varis
    - Assign a Doctor
    - Selecting a Location
    - Adding Insurance Information
    - Verifying Insurance
    - Adding an Ailment
    - Printing and/or Viewing Schedules from OWAN
    - Self Pay Patients
g. Varis 7.0 User Guide Front Desk Staff

SECTION 6:

a. Medical Support Staff Responsibilities
b. Brachytherapy Registered Nurse Responsibilities
c. Medical Prescriptions and Prescription Pads
d. Zevalin Patients
e. Quadramet Injections Policy and Procedures
f. Scheduling Fusion MRI
g. Order Form for MRI Fusion
h. Identifying Patients Who Are in Hospitals, Skilled Nursing Facilities or Enrolled in Hospice
i. Procedure for Scheduling Diagnostic PET CT Scans
j. Guidelines for Supportive Care Specific to Amifostine
k. Pharmaceutical Services
l. Brachytherapy Respiratory Therapist Responsibilities

SECTION 7:

a. Patient Coordinator Responsibilities

SECTION 8:

a. Senior Therapist's Responsibilities
b. Therapist's Responsibilities
c. Radiation Therapist Clinical Orientation
d. Daily Closing Walk Through
e. Daily QA
f. Radiation Treatment Prescription
g. Radiation Therapist Daily Chart Review

h. Patient Identification Verification
i. Accuracy and Precision of Patient Treatment Utilizing the Varis Record and Verify System
j. Removal of Key from All Accelerators
k. Shutting Down Linear Accelerators
l. Personnel Radiation Monitoring
m. Patient Monitoring During Radiation Treatment
n. Port Film Verification and Isocenter Verification
o. Policy and Procedure for Double Exposure Portals
p. Port Film Approval Verification – Varis
q. Policy and Procedure for the Use of MLC and IMRT
r. OBI Daily QA Procedure
s. Portal Vision User Guide
t. Therapist Cheat Sheet for VARiS
u. Image Guided Radiation Therapy Treatment Delivery Policy and Procedure With and Without Use of OBI/Also Helpful Hints
v. Using the Manual Match Tool to Verify Patient Positioning (IGRT)
w. BAT/I-Beam Use and Documentation
x. Full Bladder Example
y. Radiation Dose Measurement
za. Patient Photos On In-room Monitors (10 Pages)
zb. Policy and Procedure for Daily Tomotherapy Powering On and Warm-up (5 Pages)
zc. Policy and Procedure for Treatment Delivery Using Tomotherapy (5 Pages)
zd. Policy and Procedure to Perform Calypso Daily
ze. Copy of Morning Start-up Procedure for Clinac and OBI from Varian
zf. Copy of Start-up from Emergency Shutdown or Power Failure
zg. Steps to Take if You Took the CBCT, and it Gets Hung Up
zh. ONLY for LANTIS Users—Steps for Exporting CMS XiO Plans to LANTIS With Conebeam
zi. Respiratory Gating User Guide
zj. Blood Irradiation Procedure for Radiation Therapist (8 Pages)
zm. Policy and Procedure for Stereotactic Radiation
zn. Photograph Identity and Parts Checklist Stereotactic Halo
zo. High Energy Linear Accelerators Daily QC
zp. Daily Linear Accelerator Low Energy
zq. QA Beam Checker
zr. High Energy Linear Accelerator Daily QC—Machine: Varian Cl2100C
zs. Key for Beam Modifiers, Immobilization Devices, etc.
zt. Chart Round Policy
zu. Gamma Function PP
zv. Clinical Guidelines
zw. Treating with Compensators P&P
zx. Prostate Immobilization
zy. Radiation Treatment Process

SECTION 9:

a. Simulation
b. Simulation Procedure
c. Medical Skin Marking for Localization
d. Information Required on Simulation Films
e. T & O/HDR Verification Form
f. Reference Use Old 3-D Breasts Simulation Points to Remember

g. Small Bowel Series Guide

SECTION 10:

a. CT Protocol
b. CT Table Limitations
c. Morning QA for High-Speed CT/i
d. QA Usually Done On the Older CT Scans Pages 13-2 Through 13-11
e. CT Pubic Arch Study
f. CT Post Seeds Only
g. Mammosite Procedure
h. CT for Mammosite Planning
i. CT and Verification of Films for HDR Prostate
j. Interstitial Breast Procedure
k. CT/Physics Merge
l. Policy and Procedure for Image Generation and Laser Marking in Virtual Simulation
m. CT Alert as it Pertains to Contrast and Patient Name
o. Contrast Media Questionnaire
p. Emergency Meds for Contrast Reaction
q. Pediatric Contrast Policy and Procedure
r. Policy and Procedure for Seed IMRT Patients
s. Physician CT/Simulation Form Pubic Arch Study
t. Physician CT Scan Form
u. Physician MRI Scan Form
v. Immobilization Devices
w. Copy of Med-Tec Prone Head Holder User Manual
x. Immobilization Devices Setup Sheets

SECTION 11:

a. Emergency Procedures for Micro Selection – HDR IR-192
b. HDR Treatment Protocol
c. Daily Nucletron Unit Quality Control
d. Nucletron Unit Daily QC (Completed by Physics)
e. Policy and Procedure for Correct Scheduling, Simulations and Performing Skin HDR
f. Interstitial
    - Pre Procedure
    - Procedure
    - Removal of Catheters
g. Cleaning Methods
h. Sterilization Methods for Flexible Nylon Implant Tube Set
i. HDR and Brachytherapy Section:
    - Permits
    - Procedures
    - HDR Brachytherapy Procedure Sheet (Examples)
    - Physician Order Sheet (Example)
    - Discharge Instructions
j. Catherization
k. Vaginal Cylinders
l. T&O Placement Procedure from Surgeon
m. Narcotics Procedure
n. High Level Disinfection

o. Wavicide Copy
p. Patient Information Regarding Brachytherapy for Cancer of the Prostate (6 Pages)

SECTION 12:

a. Intravascular Brachytherapy (IVB) Guidelines for Front Desk Personnel
b. Memorandum Regarding Endovascular Brachytherapy Guidelines
c. OFS Policy Special Procedures
d. Procedure for Processing Special Procedure Folder IVB

SECTION 13:

a. Disaster Preparedness Basic Plan
b. Fire Control Plan
c. When an Accident/Injury Occurs While on the Job
d. Employee In-house Incident Report (Copy of Form)
e. Automobile Incident Report
f. Patient Incident Report

SECTION 14:

a. Patient Transporter Responsibilities
b. Copy of Vehicle Maintenance Schedule for All Departments
c. General Rules for Transporting (3 Pages)
d. Complimentary Transportation Policy
e. Policy - Transportation Eligibility Form
f. Guidelines for Employees Driving Personal or Company Supplied Vehicles on Company Business

SECTION 15:

a. Courier Responsibilities

SECTION 16:

a. Block Mold Room Guidelines

SECTION 17:

a. Physician Assistant Policy

SECTION 18:

a. Physician Presence Requirement
b. Medical Emergencies
c. Emergency After Hours Treatment
d. Management of Patients Who Become Critically Ill
e. Physician Hospital Rounds
f. Prescription for IGRT and CBCT
g. Incident Reporting to Patient
h. Verbal and/or Telephone Physician Orders

SECTION 19:

a. Universal Precautions
b. Use of Spill Kit Policy and Procedure

c. Infection Control Universal Precautions and Bloodborne Pathogens

SECTION 20:

a. Abbreviations Frequently Used by Technical Staff

SECTION 21:

a. Scheduling Considerations for P.E.T. Scans
b. P.E.T./CT Study
e. PET Order Form

RADIATION THERAPIST
CODE OF ETHICS

ASRT Code of Ethics

- The radiologic technologist conducts himself or herself in a professional manner, responds to patient needs and supports colleagues and associates in providing quality patient care.

- The radiologic technologist delivers patient care and service unrestricted by concerns of personal attributes or the nature of the disease or illness, and without discrimination on the basis of sex, race, creed, religion or socio-economic status.

- The radiologic technologist practices technology founded upon theoretical knowledge and concepts, uses equipment and accessories consistent with the purpose for which they were designed and employs procedures and techniques appropriately.

- The radiologic technologist assesses situations; exercises care, discretion and judgment; assumes responsibility for professional decisions; and acts in the best interest of the patient.

- The radiologic technologist acts as an agent through observation and communication to obtain pertinent information for the physician to aid in the diagnosis and treatment of the patient and recognizes that interpretation and diagnosis are outside the scope of practice for the profession.

- The radiologic technologist uses equipment and accessories, employs techniques and procedures, performs services in accordance with an accepted standard of practice and demonstrates expertise in minimizing radiation exposure to the patient, self and other members of the health care team.

- The radiologic technologist practices ethical conduct appropriate to the profession and protects the patient's right to quality radiologic technology care.

- The radiologic technologist respects confidences entrusted in the course of professional practice, respects the patient's right to privacy and reveals confidential information only as required by law or to protect the welfare of the individual or the community.

Policy:015-051	PURPOSE OF TQM MANUAL		Page: 1
Dept. Name:	Review/Approve Date:	Responsible Reviewer(s): Name/Title: Gail E. Cummings RTT	
Regulatory/Code Reference:	Status: Eff. Date: Revised: Retired Date:	Name/Title: Madlyn Dornaus Compliance	

PURPOSE

The following is a manual for Total Quality Management, including our Policy and Procedures, whose purpose is to objectively and systematically monitor and evaluate the quality of patient care delivered, and the procedures followed at our centers.

Our centers strive to guarantee the finest in cancer treatment, to make the period of treatment as easily tolerated as possible in terms of the physical and emotional status of the patient. We strive to be able to offer the newest improvements in therapy as soon as they are available and to continue to support clinical research to hasten the way all types of cancer can be cured.

Our patients are inpatients (as in local hospitals) or outpatients who require treatment of malignant (path proven) or appropriate benign diseases with high-energy radiation and/or brachytherapy sources for intracavitary, interstitial and skin treatments utilizing IMRT, IGRT, etc. All of our centers cater to the needs of the cancer patient. We are open Monday through Friday for patients currently undergoing external beam radiation therapy from 7:00 a.m. until finished. We are available seven days a week, 24 hours a day, for any emergency situation.

The radiation oncologist has the overall responsibility for his/her center. He/she determines the need for radiation therapy, designs the radiation therapy prescription, supervises its administration, and follows its results.

The physicist has the ultimate responsibility for baseline testing and periodic calibration of all of our radiation equipment. In addition, he will be consulted by the Radiation Oncologist to analyze and develop a summary when the radiation therapy has a particularly complex dosimetry problem, treatment plan, or other clinical physics situations that require his/her expertise.

The dosimetrists calculate the dosage of radiation to be delivered.

The radiation therapists then confirm and deliver the prescribed radiation dosage.

No single person can perform all of the above. Coordinated interaction is required to deliver optimal patient care.

There are **five** important processes involved in the evaluation and treatment of a patient with radiation therapy. These are:

1) **Initial consultation** – at which the patient is evaluated and the method of treatment formulated, including documentation of diagnosis.
2) **Radiation Therapy virtual simulation and its treatment planning**
3) **The actual treatment of the patient**
4) **Weekly status check of patients progress**
5) **Post treatment follow-up schedule**

The following information illustrated the steps accomplished in our centers and the personnel required to provide the up-most patient care in our radiation therapy centers. This diagram illustrates how a patient progresses through our system and the key and supportive staff involved:

PATIENT PROCESS	KEY STAFF	SUPPORT STAFF
Diagnosis a. Tumor pathology b. Staging	Referring Phycisian Pathologist	
Patient consultation request from hospital or physician referral	Front Reception Chief Therapist Medical Support Staff	
Collecting and establishing patient record/chart	Front Reception	
Clinical Evaluation: a. Physical exam- standard or extensive (extensive requires instruments) b. Review x-ray studies, pathology reports and slides c. Discussion w/referring physician, Patient and family outlining plan, risks and patient right of refusal	Radiation Oncologist	PA/Medical Support Staff
Radiation Therapy need to identify tumor extent and sensitive organs Decision made about: a. Cure or palliative b. Modality of treatment (photons, electrons, brachytherapy)	Radiation Oncologist	
Position , immobilization, patient data acquisition (CT, MRI, conventional simulation)	Radiation Therapist or CT Technologist	
Treatment Planning Continues a. Decision about treatment techniques, dose calculations, accessories, etc. b. Analysis of alternate plans	Radiation Oncologist Dosimetrist	Physicist Dosimetrist
Treatment Simulation a. Radiographic verification of treatment fields or iso-center verification	Radiation Oncologist Radiation Therapist	
Treatment: a. Daily treatment delivery b. Portal localization films	Radiation Oncologist Radiation Technologist	Physicist Dosimetry
Evaluation During Treatment a. Treatment tolerance b. Tumor response	Radiation Oncologist	PA/Medical Support Team
Follow-up Exams a. Tumor Control	Radiation Oncologist Medical Support Staff	Research

b. Normal tissue response		

A patient is seen within 24 hours following receipt of a consultation request unless the referring physician or patient requests a later time. Emergency patients are expedited. Following the initial patient evaluation, special diagnostic studies may be needed to clarify the extent of tumor and potential sites of metastatic spread. After these studies are completed, the nature of the treatment, potential risks (both short- and long-term), and possible alternatives are discussed with the patient and family. This includes the patient's right to refuse with the knowledge of the possible consequences having been explained.

The next critical step is treatment planning. The CT sim or simulator is used for precise and accurate tumor localization. The use of a CT sim or simulator is important in being able to achieve the maximum use of the treatment planning system. There are several equipment options used in our centers to achieve simulation for treatment planning they are

a. Conventional simulators
b. CT/SIM w/Virtual simulation

Conventional Simulator Process

During simulation the patient's tumor and critical organs to be spared during irradiation can be visualized under fluoroscopy and the patient can be repositioned by remote tabletop controls while all parameters are recorded. Once the potential treatment fields and isocenters are established, additional studies may be required such as IVP for kidney localization, urinary catheter for prostate position, barium enema for rectum localization, and UGI studies for potential sites of exclusion or inclusion of an organ. Filming of all physical aspects of treatment is carried out on the simulator.

Mid-line contour or CT information is obtained next. If the central axis contour is used in the treatment position, then the tumor bearing area and margin considered to be at risk along with other critical organs are graphically localized within the outline of the contour. This contour is then transferred to our treatment-planning computer, which represents, theorectically, all the beam parameters stored. Our dosimetrist or physicist then determines, with the physician, the ideal dose configuration. If not, the process begins again to make a second approach to treatment. Once the plan has been approved by the Radiation Oncologist, treatment may be initiated.

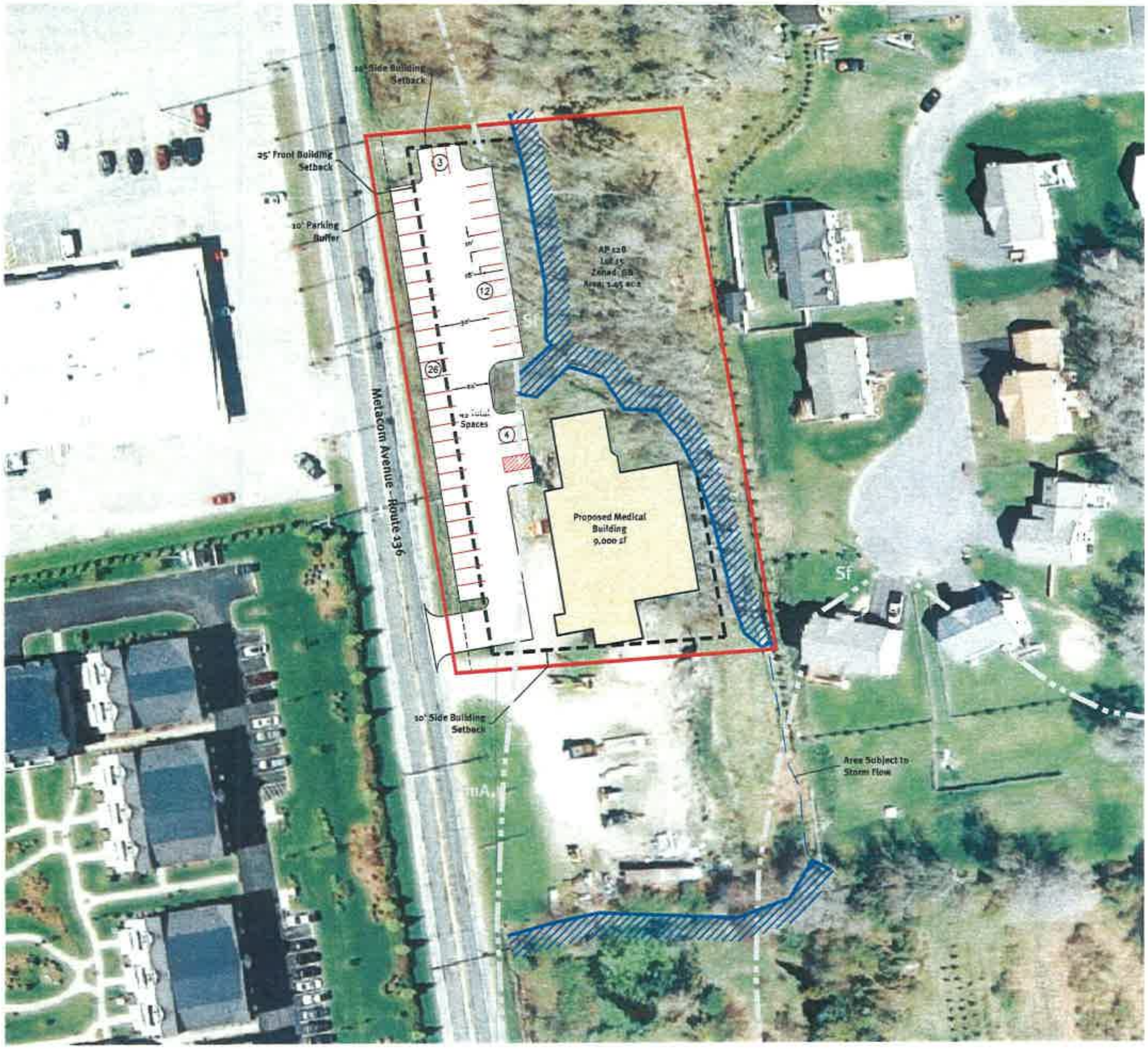
CT/Sim w/Virtual simulation

Ct scans provide the most useful data for treatment planning purposes. The area to be treated is scanned with the patient in his/her immobilization device, using parameters set up according to the needs of the treatment planning team. CT images are then sent to the virtual simulation workstation. In virtual sim the target is defined first, and then the fields are designed or shaped to conform to the target. Once target has been defined the computer calculates isocenter using the temporary reference points that were placed on the patient prior to the scan, and the lasers adjust automatically. Often times the patient is sent home with temporary marks until Radiation Oncologist defines the target, then the shift is completed. Once shift is completed and isocenter verification or block/field check is approved by the Radiation Oncologist treatment may be initiated.

The day-to-day treatment of the patient with radiation therapy must be accurately maintained. Control of treatment quality is achieved by the use of weekly portal films, daily IGRT or weekly CBCT that verify the treatment plan. In addition, we further confirm delivered dose by the use of microdosimetry or TLD within the first week of treatment.

The physics quality control is achieved by weekly checks of all calculations and treatment delivery. Each week all parameters of treatment are thoroughly reviewed, these parameters being films, physics, and patient status.

Exhibit D1



Dimensional Regulations:

CURRENT ZONING:	GENERAL BUSINESS (GB)
MINIMUM LOT AREA:	10,000 SF
MINIMUM FRONTAGE AND LOT WIDTH:	100'
MINIMUM FRONT YARD:	25'
MINIMUM SIDE YARD:	10'
MINIMUM REAR YARD:	30'
MAXIMUM STRUCTURE HEIGHT:	35'
MAXIMUM LOT STRUCTURE COVERAGE:	40%
MAXIMUM LOT STRUCTURE & PAVEMENT COVERAGE:	70%

Parking Regulations:

MEDICAL CLINIC: 1 PER 200 SF GFA

Parking Regulations:

9,000 SF BUILDING/ 200 GFA = 45 PARKING SPACES REQUIRED
TOTAL SPACES PROVIDED = 45 PARKING SPACES

Soil Information:

(REFERENCE: SOIL SURVEY OF RHODE ISLAND, U.S.D.A. SOIL CONSERVATION SERVICE)

SOIL NAME	DESCRIPTION
NtB	NEWPORT VERY STONY SILT LOAM, 3 TO 8 PERCENT SLOPES
PmA	PITTSTOWN SILT LOAM, 0 TO 3 PERCENT SLOPES
Sf	STISSING VERY STONY SILT LOAM

Certification Note:

THE EXISTING DATA COMPILED ON THIS CONCEPT/STUDY PLAN IS FROM EXISTING MAPS AND RECORDED DATA. DUE TO METHODS OF COMPILATION AND ACCURACY OF SOME MAPS USED TO COMPILE THIS PLAN, THERE MAY BE SOME DEVIATIONS FROM SAID MAPS AND/OR DATA AND THIS PLAN. THERE ARE MANY FACTORS WHICH LEAD TO THIS, INCLUDING THE ACCURACY OF SAID MAPS AND DATA, AND KNOWN SITE FEATURES SUCH AS STONE WALLS, ROADWAYS, AND BUILDINGS. THESE DEVIATIONS ARE COMMON WHEN COMPILING MAPS AND DATA FROM VARIOUS SOURCES AND CANNOT BE AVOIDED WITHOUT AN ACTUAL FIELD SURVEY AND DEED RESEARCH. THIS PLAN IS TO BE UTILIZED FOR DISCUSSION PURPOSES ONLY.

THIS PLAN IS SUBSTANTIALLY CORRECT IN ACCORDANCE WITH A CLASS IV STANDARD AS ADOPTED BY THE RHODE ISLAND BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS. THIS PLAN IS NOT TO BE CONSTRUED AS AN ACCURATE BOUNDARY SURVEY AND MAY BE SUBJECT TO SUCH CHANGES AS AN ACCURATE BOUNDARY SURVEY MAY DISCLOSE.

THE WETLAND EDGE SHOWN ON THIS PLAN WAS DELINEATED AND FIELD LOCATED BY DIPRETE ENGINEERING IN JUNE, 2012. THIS WETLAND EDGE IS SUBJECT TO RIDEM WETLAND EDGE VERIFICATION.

Legend:

PROPERTY LINE
TOWN BUILDING SETBACKS
SOIL BOUNDARY LINE
SOIL IDENTIFICATION
FLAGGED WETLAND EDGE
(SUBJECT TO RIDEM VERIFICATION)

Scale: 1"=30'
0 15' 30' 60'

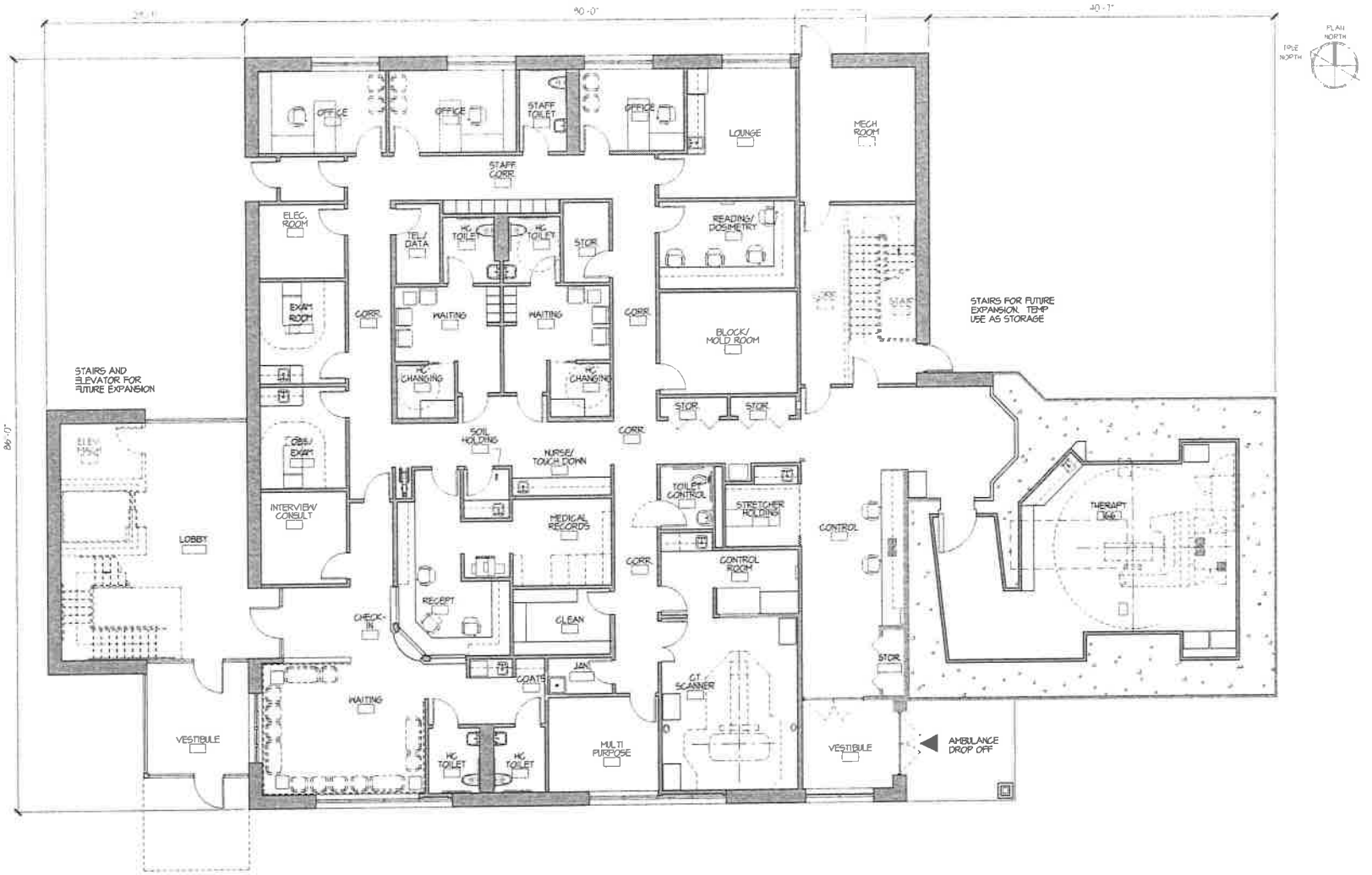
Concept Plan

Bristol, Rhode Island

DiPrete Engineering

Prepared for:

NEMD Architects



PRELIMINARY FLOOR PLAN

DATE JUNE 28, 2012

SCALE NTS

nemd architects

n|e|m|d architects inc.
architects | planners | interior designers

EAST BAY CANCER CENTER

METACOM AVENUE, BRISTOL, RI

Exhibit D2

n|e|m|d architects, inc.
architects | planners | interior designers
95 Sockanosset Cross Road, Suite 203 | Cranston, Rhode Island 02920
T: 401.435.3532 | F: 401.435.3712 | www.nemd.com | nemd@nemd.com

June 28, 2012

Ms. Patricia K. Rocha, Attorney
Adler Pollock & Sheehan P.C.
One Citizens Plaza, 8th Floor
Providence, RI 02903

Re: East Bay Cancer Center
Lot # 15
Metacom Avenue
Bristol, RI

Dear Ms. Rocha:

We have produced a preliminary design for this suite based on the owners program, the requirements for Ambulatory Care Suites outlined in the 2010 FGI Guidelines for Design and Construction of Health Care Facilities (Sections 3.1 Common Elements for Outpatient Facilities, 3.2 Specific Requirements for Primary Care Outpatient Centers, Sections 2.2-3.6.4 Radio Therapy Suite through 2.2-3.6.8 Support Areas for Patients where those requirements relate to this program), RI State Building Code (IBC 2006 with amendments), NFPA 101 and 2010 ADA Standards for Accessible Design. The current layout includes a Radiation Therapy Room and a CT Simulator with all required support spaces. This is a preliminary layout only and may need to be adjusted to meet programmatic and/or specific equipment requirements. The preliminary design as qualified herein is in full compliance with the 2010 Guidelines.

Please note that at this time the 2006 AIA Guidelines for Design and Construction of Health Care Facilities are in effect in Rhode Island. However as the state is planning to adopt the 2010 Guidelines at some time in the future we have endeavored to meet these future requirements. This layout is designed to meet both the current and the proposed requirements.

For this preliminary plan we have not shown all of the required equipment (e.g. under counter refrigerators, code cart, automatic medicine dispensers etc) or furniture. We have indicated some furniture to confirm that the space provided meets required clearances. We have provided storage throughout but have not necessarily designated use. We have not located all required staff spaces as

n|e|m|d
architects

some conversations with the user group(s) will be necessary to customize the facility to their needs. Space is provided to accommodate all required program functions. In addition all radiation therapy space will be designed and tested to meet radiation protection requirements. M/E/P/FP systems will be designed to meet all applicable codes and guidelines. Finally we have not indicated rated construction but rated construction will be provided where required by the above noted codes and guidelines. All required information will be included in final documents.

Please contact me if you have any questions or concerns regarding this letter.

Sincerely,

Joanne O'Connell-Foster, RI License #2636
Principal,
n|e|m|d architects, RI COA A-14,010

Cc: Mr. Greg Mercurio, 1800 Mineral Spring Avenue, PO Box 309, North Providence, RI 02904
n|e|m|d file

Attachments: Preliminary Floor Plan dated June 28, 2012

Exhibit D6

OPTION AGREEMENT

For good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Rego Family Partnership ("Landlord") and East Bay Holdings, LLC, a Rhode Island limited liability company or its designee ("East Bay") hereby agree that subsequent to approval from the Rhode Island Department of Health ("DOH") for the East Bay Comprehensive Cancer Care, LLC ("Cancer Care") Certificate of Need ("CON") Application, Landlord and East Bay shall enter into a Ground Lease (the "Lease") mutually agreeable to the parties granting East Bay the right to use and occupy a certain 1.4 acre parcel of vacant land constituting Plat 128 Lot 15 located on Metacom Avenue, Bristol, Rhode Island (the "Premises") and to construct on the Premises a custom designed physician office building with linear accelerator. The Lease contains without limitation, the following terms:

1. Term: Thirty (30) year Ground Lease.

2. Term Commencement: Receipt of DOH approval of Certificate of Need Application of Cancer Care.

3. Annual Rent: To be determined.

4. Security Deposit: One ($1.00) Dollar.

5. Use of Premises: The Premises shall be used for a physician office building with linear accelerator.

6. Sublease: East Bay shall sublease the Premises to Cancer Care. Cancer Care agrees to sublease the Premises from East Bay.

7. Exercise. East Bay shall exercise this Option prior to December 31, 2012 by delivery to Landlord of the DOH CON together with written notice of its exercise of this Option, which notice shall specify a time, date and place for the execution of the ground lease (the "Closing") which is between ten (10) and thirty (30) days after the date of East Bay's notice of exercise.

8. Access. For the period during which this Option is in effect, East Bay and any of its agents and representatives shall have reasonable access to the Premises subject to the provisions of this Option and subject to prior written notice to Landlord and delivery of such insurance and indemnity agreements as Landlord may reasonably require for the following purposes: (a) inspecting and examining the Premises; (b) performing various kinds of tests on the Premises as to soil, water and other conditions; and (c) otherwise dealing with respect to the Premises, with any governmental or similar bodies having jurisdiction over the Premises in connection with environmental, traffic, building, zoning and other land use laws, ordinances, codes and regulations.

IN WITNESS WHEREOF, the undersigned have executed this Option Agreement as of June 29, 2012.

East Bay Comprehensive Cancer Care, LLC

By: Gregory A. Mercurio
Name: Gregory A. Mercurio Jr.
Title: Manager

Rego Family Partnership

By: Gloria J. Rego by her attorney in fact Judy Rego
Name: GLORIA J. REGO
Title: GENERAL PARTNER

East Bay Holdings, LLC

By: John A. Pachinami Esq
Name: John A. Pachinami Jr
Title: Incorporator / Organizer

612043.2

Exhibit D8

Town of Bristol, RI
WATER POLLUTION CONTROL DEPARTMENT
2 PLANT AVENUE
BRISTOL, RI 02809-3015
(401) 253-8877 fax: (401) 253-2910

Jose' J. Da Silva, Superintendent

TOWN
10 COUR
BRISTO
(401)

June 29, 2012

TO: Chris Vitale

RE: Sewer Connection Pl 128 Lot 15 Metacom Ave

The above location has sewer available. The owner is responsible to verify that the evaluation of line will allow for connection to the town sewer.

Jose J. Da Silva
Superintendent

BRISTOL COUNTY WATER AUTHORITY

July 2, 2012

Ms. Patricia Rocha, Esq.
Adler, Pollock & Sheehan P.C.
One Citizens Plaza
Providence, RI 02903

Re: Plat 128 Lot 15, Metacom Avenue, Bristol RI

Dear Ms. Rocha,

The Bristol County Water Authority has reviewed it capability to provide public water service to the above referenced property. There is a water main in Metacom Avenue available to provide public water service to the property, dependent on the projected domestic and fire flow demands. The area surrounding the proposed building site is recognized as being a low pressure zone. Please be advised that a comprehensive analysis of the project's needs must be completed by this office prior to the issuance of a formal service approval.

Please contact this office if you have any questions regarding either this letter or our water service application process.

Yours truly,

Kenneth Booth
Operations Manger

c.c. Pamela Marchand

450 Child St. • P.O. Box 447 • Warren, Rhode Island 02885-0447 • www.bcwari.com • Fax: 401-245-2004 • Tel: 401-245-2022
A Public Agency

Exhibit F5

Lease versus Purchase Comparison

Cost of Equipment	$4,325,000
% Downpayment	33.00%
Amount Borrowed	$2,897,750
Term of Lease (Months)	60
Interest Rate (Annual)	7.50%
Annual Lease Payments	$696,780
Economic Life (Months)	120
Salvage Value of Equipment	$2,162,500
Purchase Options	$1 buyout
Value of Insurance	4,325,000
Discount Rate	15.00%
Discounted Cash Flow under Lease (incl. 33% Downpayment)	3,867,987
Cost of Equipment	4,325,000
Difference	457,013

	Principal	Interest
Year 1	$496,277.61	$200,501.98
Year 2	534,804.93	161,974.66
Year 3	576,323.22	120,456.36
Year 4	621,064.69	75,714.90
Year 5	669,279.56	27,500.03
Total	###########	$586,147.93

	Principal	Interest	Total
1	$39,954.03	$18,110.94	$58,064.97
2	$40,203.74	$17,861.22	$58,064.97
3	$40,455.01	$17,609.95	$58,064.97
4	$40,707.86	$17,357.11	$58,064.97
5	$40,962.28	$17,102.68	$58,064.97
6	$41,218.30	$16,846.67	$58,064.97
7	$41,475.91	$16,589.05	$58,064.97
8	$41,735.14	$16,329.83	$58,064.97
9	$41,995.98	$16,068.99	$58,064.97
10	$42,258.45	$15,806.51	$58,064.97
11	$42,522.57	$15,542.40	$58,064.97
12	$42,788.34	$15,276.63	$58,064.97
13	$43,055.76	$15,009.20	$58,064.97
14	$43,324.86	$14,740.10	$58,064.97
15	$43,595.64	$14,469.32	$58,064.97
16	$43,868.11	$14,196.85	$58,064.97
17	$44,142.29	$13,922.68	$58,064.97
18	$44,418.18	$13,646.79	$58,064.97
19	$44,695.79	$13,369.17	$58,064.97
20	$44,975.14	$13,089.82	$58,064.97

21	$45,256.24	$12,808.73	$58,064.97
22	$45,539.09	$12,525.88	$58,064.97
23	$45,823.71	$12,241.26	$58,064.97
24	$46,110.11	$11,954.86	$58,064.97
25	$46,398.29	$11,666.67	$58,064.97
26	$46,688.28	$11,376.68	$58,064.97
27	$46,980.08	$11,084.88	$58,064.97
28	$47,273.71	$10,791.26	$58,064.97
29	$47,569.17	$10,495.79	$58,064.97
30	$47,866.48	$10,198.49	$58,064.97
31	$48,165.64	$9,899.32	$58,064.97
32	$48,466.68	$9,598.29	$58,064.97
33	$48,769.60	$9,295.37	$58,064.97
34	$49,074.41	$8,990.56	$58,064.97
35	$49,381.12	$8,683.84	$58,064.97
36	$49,689.75	$8,375.21	$58,064.97
37	$50,000.31	$8,064.65	$58,064.97
38	$50,312.82	$7,752.15	$58,064.97
39	$50,627.27	$7,437.69	$58,064.97
40	$50,943.69	$7,121.27	$58,064.97
41	$51,262.09	$6,802.88	$58,064.97
42	$51,582.48	$6,482.49	$58,064.97
43	$51,904.87	$6,160.10	$58,064.97
44	$52,229.27	$5,835.69	$58,064.97
45	$52,555.71	$5,509.26	$58,064.97
46	$52,884.18	$5,180.79	$58,064.97
47	$53,214.71	$4,850.26	$58,064.97
48	$53,547.30	$4,517.67	$58,064.97
49	$53,881.97	$4,183.00	$58,064.97
50	$54,218.73	$3,846.23	$58,064.97
51	$54,557.60	$3,507.37	$58,064.97
52	$54,898.58	$3,166.38	$58,064.97
53	$55,241.70	$2,823.27	$58,064.97
54	$55,586.96	$2,478.01	$58,064.97
55	$55,934.38	$2,130.59	$58,064.97
56	$56,283.97	$1,781.00	$58,064.97
57	$56,635.74	$1,429.22	$58,064.97
58	$56,989.72	$1,075.25	$58,064.97

59	$57,345.90	$719.06	$58,064.97
60	$57,704.31	$360.65	$58,064.97

Exhibit G6

I. RADIATION THERAPY SERVICES, INC. ("RTSI")

A.	**Ownership:**	Publicly traded company
B.	**Type of Facility**	See Below
C.	**Address**	2234 Colonial Boulevard Fort Myers, FL 33907
D.	**State License Number**	N/A
E.	**Medicare Provider Number**	N/A
F.	**Accreditation**	N/A

II. 21st CENTURY ONCOLOGY, INC.

A.	**Ownership:**	Wholly owned by RTSI
B.	**Type of Facility**	See Below
C.	**Address**	2234 Colonial Boulevard Fort Myers, FL 33907
D.	**State License Number**	N/A
E.	**Medicare Provider Number**	Group # 77215
F.	**Accreditation**	N/A

III. RTSI/21st CENTURY ONCOLOGY, INC. FACILITIES - BY STATE

Facility	Type of Facility	ADRS1	ADRS2	CITY	STATE	ZIP	State License Number	Medicare Provider Number	Accreditation
Andalusia	Radiation Therapy	104 Medical Park Dr.		Andalusia	AL	36420		510G700101	ACRO
Dothan	Radiation Therapy	4274 West Main Street		Dothan	AL	36305		510G700101	ACRO
Casa Grande	Radiation Therapy	1281 East Cottonwood Lane		Casa Grande	AZ	85222	OTC 4173	Z114904	
Scottsdale	Radiation Therapy	7340 East Thomas Road		Scottsdale	AZ	85251	OTC 4232	Z106337	
Sun City	Radiation Therapy	13184 N. 103rd Drive		Sun City	AZ	85351	OTC 4533	Z106337	
Hatcher	Radiation Therapy	334 East Hatcher Rd		Phoenix	AZ	85020	OTC 4531	Z106337	
Sun City West	Radiation Therapy	14506 Meeker Blvd.		Sun City West	AZ	85375	OTC 4532	Z106337	
El Segundo	Radiation Therapy	860 Parkview Dr. N.		El Segundo	CA	90245		W19907	
Indio	Radiation Therapy	46-883 Monroe Street	Suite 100	Indio	CA	92201		ZZZ03015Z	ACRO
Mount Shasta	Radiation Therapy	902 Pine Street		Mount Shasta	CA	96067		BK819	
Palm Desert	Radiation Therapy	77840 Flora Road		Palm Desert	CA	92211		ZZZ03015Z	ACRO
Redding	Radiation Therapy	963 Butte Street		Redding	CA	96001		BK819	
Rancho Mirage	Radiation Therapy	40055 Bob Hope Drive	Suite B	Rancho Mirage	CA	92270		ZZZ03015Z	ACRO
Santa Monica	Radiation Therapy	2428 Santa Monica Blvd		Santa Monica	CA	90404		W19907	
Solace	Radiation Therapy	310 Hartnell Avenue		Redding	CA	96002		BK819	
Yucca Valley	Radiation Therapy	58295 "29" Palms Hwy		Yucca Valley	CA	92284		ZZZ03015Z	ACRO
Aventura	Radiation Therapy	21355 E. Dixie Highway	Suite 111	Aventura	FL	33180		77215E	ACRO
Bradenton	Radiation Therapy	6555 Cortez Road		Bradenton	FL	34201		77215C	ACRO
Bonita Springs	Radiation Therapy	8991 Brighton Lane		Bonita Springs	FL	34135		77215	ACRO
Deerfield Beach	Radiation Therapy	266 West Hillsboro Boulevard		Deerfield Beach	FL	33441		77215	ACRO
Cape Coral	Radiation Therapy	1419 SE 8th Terrace		Cape Coral	FL	33990		77215	ACRO
Crestview	Radiation Therapy	601 Redstone Ave. West		Crestview	FL	32536		77215C	ACRO
Coral Springs	Radiation Therapy	2101 Riverside Dr.	Unit 101/102	Coral Springs	FL	33071		77215	ACRO
Destin	Radiation Therapy	6879 U.S. Hwy 98 West		Santa Rosa Beach	FL	32459		77215C	ACRO
Englewood	Radiation Therapy	571 Medical Drive		Englewood	FL	34223		77215C	ACRO
Fort Myers	Radiation Therapy	3680 Broadway		Fort Myers	FL	33901		77215	ACRO
Fort Walton Beach	Radiation Therapy	1026 Mar Walt Drive, N.W.		Fort Walton Beach	FL	32547		77215C	ACRO
Venice	Radiation Therapy	959 E. Venice Avenue		Venice	FL	34292		77215C	ACRO
Jacksonville	Radiation Therapy	7751 Baymeadows Rd. E.		Jacksonville	FL	32256		AK201	
Key West	Radiation Therapy	3426 N. Roosevelt Blvd		Key West	FL	33041		77215E	ACRO
Lehigh Acres	Radiation Therapy	1120 Lee Boulevard		Lehigh Acres	FL	33936		77215	ACRO
Lee Cancer Center	Radiation Therapy	8931 Colonial Center Drive	Suite 100	Fort Myers	FL	33905		77215	ACRO
Lutgert Naples	Radiation Therapy	733 4th Avenue North		Naples	FL	34102		77215	
Lakes Park	Radiation Therapy	7341 Gladiolus Drive		Fort Myers	FL	33908		77215	ACRO
Lakewood Ranch Oncology Center	Radiation Therapy	8946 77th Terrace East		Bradenton	FL	34202		77215C	
Lakewood Ranch	Radiation Therapy	6310 Health Parkway		Bradenton	FL	34202		77215C	ACRO
Broward General Hospital	Radiation Therapy	1600 S. Andrews Ave.		Ft. Lauderdale	FL	33316		77215	
North Broward Hospital	Radiation Therapy	201 East Sample Road		Deerfield Beach	FL	33064		77215	
North Naples	Radiation Therapy	1885 SW Health Parkway		Naples	FL	34109		77215	ACRO
Port Charlotte	Radiation Therapy	3175 Harbor Blvd		Port Charlotte	FL	33952		77215C	ACRO
Pembroke Pines	Radiation Therapy	12105 Pembroke Rd.	Unit 601	Pembroke Pines	FL	33025		77215	
Plantation	Radiation Therapy	350 N.W. 84th Avenue	Suite 102	Plantation	FL	33324		77215	ACRO

I. .TSI/21st CENTURY ONCOLOGY, INC. FACILITIES - BY STATE

Facility	Type of Facility	ADRS1	ADRS2	CITY	STATE	ZIP	State License Number	Medicare Provider Number	Accreditation
Palms West	Radiation Therapy	12993 Southern Boulevard		Loxahatchee	FL	33470		K3164	ACRO
South Naples	Radiation Therapy	820 Goodlette Road N		Naples	FL	34102		77215	ACRO
Sarasota	Radiation Therapy	3210 Fruitville Rd		Sarasota	FL	34237		77215C	ACRO
Tamarac	Radiation Therapy	7850 North University Drive		Tamarac	FL	33321		77215	ACRO
Danville	Radiation Therapy	520 Techwood Dr.	Suite 200	Danville	KY	40422	730037	7864	ACRO
Frankfort	Radiation Therapy	2 Physicians Park Drive		Frankfort	KY	40601	730044	7865	ACRO
London	Radiation Therapy	165 London Mountain View Drive		London	KY	40741		N/A	
Louisville	Radiation Therapy	4500 Churchman Avenue	Suite 100	Louisville	KY	40215	730046	7486	ACRO
Holyoke	Radiation Therapy	5 Hospital Dr.		Holyoke	MA	01040		MA-M21697	ACR
Southbridge	Radiation Therapy	55 Sayles Street		Southbridge	MA	01550	469M	0011459	ACR
Bel Air	Radiation Therapy	602 South Atwood Rd.	Suite 105	Bel Air	MD	21014	M335	475M - 339P	ACRO
Belcamp	Radiation Therapy	1200 Brass Mill Road	Suite E	Belcamp	MD	21017	M339	336P	ACRO
Berlin	Radiation Therapy	314 Franklin Ave.		Berlin	MD	21811	M258	092N	ACRO
Greenbelt	Radiation Therapy	7503 Greenway Center Drive		Greenbelt	MD	20770	M251	G02620	ACRO
Peninsula	Radiation Therapy	200 E. Vine Street		Salisbury	MD	21804	M26	092N	ACRO
Clarkston	Radiation Therapy	6770 Dixie Highway	Suite 106	Clarkston	MI	48346		OE06288 - OF36434	
Farmington Hills	Radiation Therapy	28595 Orchard Lake Rd.		Farmington Hills	MI	48334		OE06288 - OF36434	
Macomb Cancer Center	Radiation Therapy	17435 Hall Rd.		Macomb	MI	48044		OE06288 - OF36434	
Madison Heights	Radiation Therapy	30365 Dequindre Ave		Madison Heights	MI	48071		OE06288 - OF36434	
Monroe	Radiation Therapy	1085 N. Macomb St.		Monroe	MI	48162		OE06288 - OF36434	
Pontiac	Radiation Therapy	70 Fulton Street		Pontiac	MI	48341		OE06288 - OF36434	
Sampson Radiation Oncology	Radiation Therapy	215 Beaman Street		Clinton	NC	28328		2322650	
Wayne Radiation Oncology	Radiation Therapy	2802 McLamb Place		Goldsboro	NC	27534		2322650	
Greenville	Radiation Therapy	801 W.H. Smith Blvd.		Greenville	NC	27834		2322650	ACRO
Clyde	Radiation Therapy	600 Hospital Drive	Suite 10	Clyde	NC	28721		2322650	ACRO
Kinston Hospital	Radiation Therapy	703 Doctors Drive		Kinston	NC	28501		2322650	
Marion	Radiation Therapy	63 South Medical Court		Marion	NC	28752		2322650	
Macon	Radiation Therapy	190 Riverview Street		Franklin	NC	28734		2322650	
Hendersonville	Radiation Therapy	95 Doctor's Drive		Hendersonville	NC	28792		2322650	
Forest City	Radiation Therapy	171 Daniel Road		Forest City	NC	28043		2322650	
Brevard	Radiation Therapy	1050 Neely Road		Brevard	NC	28712		2322650	
Asheville Hematology & Oncology Radiation Therapy Associates of WNC (US Oncology)	Radiation Therapy	20 Medical Park Drive		Asheville	NC	28803		2322650	
Hammonton	Radiation Therapy	893 South White Horse Pike		Hammonton	NJ	08037	24284	085814	
Woodbury	Radiation Therapy	17 West Bank Ave.	Suite 105	Woodbury	NJ	08096	23235	085814	ACRO
Vorhees	Radiation Therapy	130 Carnie Blvd.	Suite One	Vorhees	NJ	08043	23147	085814	ACRO
Willingboro	Radiation Therapy	220 Sunset Road	Suite 4	Willingboro	NJ	08046	23190	085814	ACRO
Fort Apache	Radiation Therapy	6160 S. Fort Apache Road		Las Vegas	NV	89109		V30595	ACRO
Sunrise Valley	Radiation Therapy	3006 So. Maryland Pkwy	Suite 100	Las Vegas	NV	89109		V30595	ACRO
Henderson	Radiation Therapy	52 North Pecos Road		Henderson	NV	89014		30595 - WHBFM	ACRO
North Tenaya	Radiation Therapy	2851 North Tenaya Way	Suite 100	Las Vegas	NV	89128		30595 - WHBFM	ACRO
Bronx-Lebanon	Radiation Therapy	1650 Grand Concourse		Bronx	NY	10457		W1L091	ACRO
Regional Cancer Center	Radiation Therapy	1676 Sunset Avenue		Utica	NY	13502		W1L091	
North Westchester	Radiation Therapy	400 East Main Street		Mount Kisco	NY	10549		N/A	ACRO
Riverhill	Radiation Therapy	970 North Broadway	Suites 101 / 102	Yonkers	NY	10701		W1L091	ACRO
Rome	Radiation Therapy	91 Perimeter Road		Rome	NY	13441		N/A	
Cyberknife	Radiation Therapy	593 Eddy St.		Providence	RI	02903	ACF01603	0011553	
Roger Williams	Radiation Therapy	50 Maude St.		Providence	RI	02908	ACF01595	929005335	ACRO
South County	Radiation Therapy	142 Kenyon Avenue		Wakefield	RI	02879	ACF01596	929004398	ACRO
Woonsocket	Radiation Therapy	115 Cass Avenue	Suite 1A	Woonsocket	RI	02895	ACF01594	709003933	ACRO
Myrtle Beach	Radiation Therapy	4708 Oleander Dr.		Myrtle Beach	SC	29577		5714	ACR
Fairlea	Radiation Therapy	187 Skylar Dr.		Fairlea	WV	24902		9380041	ACRO
Martinsburg	Radiation Therapy	2000 Foundation Way	Suite 1101	Martinsburg	WV	25401		9356461	ACRO
Princeton	Radiation Therapy	210 New Hope Road		Princeton	WV	24740		9380041	ACRO

RI SOS Filing Number: 201292039550 Date: 04/26/2012 11:54 AM

Filing Fee: $150.00 **ID Number:** _____

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
Office of the Secretary of State
Corporations Division
148 W. River Street
Providence, Rhode Island 02904-2615

LIMITED LIABILITY COMPANY

ARTICLES OF ORGANIZATION

Pursuant to the provisions of Chapter 7-16 of the General Laws of Rhode Island, 1956, as amended, the following Articles of Organization are adopted for the limited liability company to be organized hereby:

1. The name of the limited liability company is:
   East Bay Comprehensive Cancer Care, LLC

2. The address of the limited liability company's resident agent in Rhode Island is:

   One Citizens Plaza, 8th Floor (Street Address, not P.O. Box) **Providence** (City/Town), RI **02903-1345** (Zip Code)

   and the name of the resident agent at such address is **Adler Pollock & Sheehan P.C.** (Name of Agent)

3. Under the terms of these Articles of Organization and any written operating agreement made or intended to be made, the limited liability company is intended to be treated for purposes of federal income taxation as:

   (Check one box only)

   ☐ a partnership *or* ☐ a corporation *or* ☑ disregarded as an entity separate from its member

4. The address of the principal office of the limited liability company if it is determined at the time of organization:
   Not Determined
   (If not determined, so state)

5. The limited liability company has the purpose of engaging in any lawful business, and shall have perpetual existence until dissolved or terminated in accordance with Chapter 7-16, unless a more limited purpose or duration is set forth in paragraph 6 of these Articles of Organization.

SECRETARY OF STATE
CORPORATIONS DIV
2012 APR 26 AM 11:54

FILED 154

APR 26 2012

BY D2 169458

Form No. 400
Revised 09/06

6. Additional provisions, if any, not inconsistent with law, which the members elect to have set forth in these Articles of Organization, including, but not limited to, any limitation of the purposes or duration for which the limited liability company is formed, and any other provision which may be included in an operating agreement:

See Exhibit A annexed hereto and made a part hereof.

7. Management of the Limited Liability Company:

A. The limited liability company is to be managed ☑ by its members. ***(If you have checked this box, go to item no. 8.)***

or

B. The limited liability company is to be managed ☐ by one (1) or more managers. ***(If the limited liability company has managers at the time of the filing of these Articles of Organization, state the name and address of each manager.)***

Manager	Address

8. The date these Articles of Organization are to become effective, if later than the date of filing, is:

(not prior to, nor more than 30 days after, the filing of these Articles of Organization)

Name and Address of Authorized Person:
Sarah T. Dowling, Attorney
Adler Pollock & Sheehan P.C.
One Citizens Plaza, 8th Floor, Providence, RI 02903-1345

Under penalty of perjury, I declare and affirm that I have examined these Articles of Organization, including any accompanying attachments, and that all statements contained herein are true and correct.

Date: April 26, 2012

Sarah T. Dowling
Signature of Authorized Person

East Bay Comprehensive Cancer Care, LLC

Articles of Organization

Exhibit A

6. Additional provisions, if any, not inconsistent with law, which the members elect to have set forth in these Articles of Organization, including, but not limited to, any limitation of the purpose or duration for which the limited liability company is formed, and any other provision which may be included in an operating agreement:

6.1 The limited liability company may be governed by an operating agreement which may be amended from time to time by the members.

6.2 A manager of the limited liability company, if there be any, or a member acting in the capacity of a manager (hereinafter called a "manager"), shall not be personally liable to the limited liability company or to its members, for monetary damages for breach of any duty provided for in Section 17 of the Rhode Island Limited Liability Company Act, as may hereafter be amended from time to time (the "Act"), except for liability of a manager for:

(1) breach of the manager's duty of loyalty to the limited liability company or its members:

(2) acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law;

(3) the liability imposed pursuant to the provisions of Section 32 of the Act relating to wrongful distributions; or

(4) any transaction from which the manager derived an improper personal benefit, unless said transaction was with the informed consent of the members of a majority of the disinterested managers.

6.3 The limited liability company shall indemnify any member, manager, agent or employee, past or present, of the limited liability company (an "Indemnified Person") to the full extent permissible pursuant to Section 7-16-4(11) of the Act; provided, however, that the limited liability company shall not indemnify any Indemnified Person for:

(1) breach of the Indemnified Person's duty of loyalty to the limited liability company or its members;

(2) acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law;

(3) the liability imposed pursuant to the provisions of Section 32 of the Act relating to wrongful distributions; or

(4) any transaction from which the Indemnified Person derived an improper personal benefit, unless said transaction was with the consent of the members of a majority of the disinterested managers.

608262.1

RI SOS Filing Number: 201292039550 Date: 04/26/2012 11:54 AM

State of Rhode Island and Providence Plantations

A. Ralph Mollis

Secretary of State

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

I, A. RALPH MOLLIS, Secretary of State of the State of Rhode Island and Providence Plantations, hereby certify that this document, duly executed in accordance with the provisions of Title 7 of the General Laws of Rhode Island, as amended, has been filed in this office on this day:

April 26, 2012 11:54 AM

A. RALPH MOLLIS

Secretary of State

76454-1-735039

OPERATING AGREEMENT
OF
EAST BAY COMPREHENSIVE CANCER CARE, LLC

OPERATING AGREEMENT, dated as of April 26, 2012, by New England Radiation Therapy Management Services, Inc. as the sole member (the "Member") of **East Bay Comprehensive Cancer Care, LLC** (the "Company"). Unless otherwise indicated, capitalized words and phrases in this Operating Agreement (the "Agreement") shall have the meanings set forth in the Glossary of Terms attached hereto as Exhibit A.

RECITALS

A. The Company was formed on April 26, 2012, upon the filing of Articles of Organization with the Office of the Secretary of State of Rhode Island.

B. The Member wishes to create this Agreement to establish the rules and procedures that are to govern the business and affairs of the Company.

NOW, THEREFORE, the Member, intending to be legally bound, does hereby constitute the operating agreement of the Company as follows

ARTICLE I.

FORMATION

SECTION 1.1. Formation. The Company was formed on April 26, 2012, and shall be continued pursuant to the terms hereof. The rights and obligations of the Member and the terms and conditions of the Company shall be governed by the Act and this Agreement. To the extent the Act and this Agreement are inconsistent with respect to any subject matter covered in this Agreement, this Agreement shall govern, but only to the extent permitted by law.

SECTION 1.2. Name. The name of the Company is East Bay Comprehensive Cancer Care, LLC.

SECTION 1.3. Purposes. The Company is formed for the purpose of engaging in any lawful act or activity for which limited liability companies may be formed under the Act.

SECTION 1.4. Commencement and Term. The term of the Company commenced at the time and date of the filing of the Articles of Organization with the Secretary of State of the State of Rhode Island and shall terminate upon the dissolution of the Company pursuant to the provisions of the Act or Article 6 below.

SECTION 1.5. Tax Classification; Requirement of Separate Books and Records and Segregation of Assets and Liabilities. Because the Company will have a single Member pursuant to Treasury Regulation Section 301.7701-3, the Company shall be disregarded as an entity separate from its owner for federal income tax purposes until the effective date of any election it may make to change its classification for federal income tax purposes to that of a corporation by filing IRS Form 8832, Entity Classification Election, or until the Company has

more than one Member in which case it would be treated as a partnership for federal income tax purposes (provided that the Company has not elected on IRS Form 8832 to be treated as a corporation). In all events, however, the Company shall keep books and records separate from those of its sole Member and shall at all times segregate and account for all of its assets and liabilities separately from those of its sole Member.

SECTION 1.6. Title to Assets; Transactions. The Company shall keep title to all of its assets in its own name and not in the name of its Member. The Company shall enter into and engage in all transactions in its own name and not in the name of its Member.

ARTICLE II.

CAPITAL CONTRIBUTIONS

SECTION 2.1. Capital Contributions. As of the date hereof, the Member has made a Capital Contribution to the Company on the date and in the amount reflected in the books and records of the Company. The Member may (but shall not be obligated to) make additional Capital Contributions in such form and at such time as the Member shall determine in its sole and absolute discretion; provided, however, that any such additional Capital Contributions shall be evidenced in writing and recorded in the books and records of the Company.

SECTION 2.2. Liability of Member. The Member shall not be liable for any debts or losses of capital or profits of the Company or be required to contribute or lend funds to the Company.

ARTICLE III.

DISTRIBUTIONS

SECTION 3.1. Distributions. Subject only to (a) such limitations (if any) as may be imposed by of the State of Rhode Island and (b) any other contractual restrictions agreed to by the Company or its Member in writing, the Company shall have authority to distribute cash or property to the Member, in such amounts, at such times and as of such record dates as the Member shall determine.

ARTICLE IV.

MANAGEMENT

SECTION 4.1. Management. The Company shall be managed by one or more managers as may be selected by the Member from time to time (each, a "Manager"). The initial Managers shall be Bryan Carey, Joseph Garcia, and Sarah Flaherty. The Company's Managers shall have complete authority and exclusive control over the business and affairs of the Company. The Managers may be removed as Managers of the Company at any time, with or without cause or notice, by the Member. The Managers shall be free to delegate management authority to officers of the Company appointed in writing by the Managers.

SECTION 4.2. Limitation of Liability. A Manager of the Company, if there be any, or a Member acting in the capacity of a Manager, shall not be personally liable to the Company or to its Member, for monetary damages for breach of any duty provided for in Section 17 of the Act, as may hereafter be amended from time to time, except for liability of a Manager for:

(1) breach of the Manager's duty of loyalty to Company or its Member;

(2) acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law;

(3) the liability imposed pursuant to the provisions of Section 32 of the Act relating to wrongful distributions; or

(4) any transaction from which the Manager derived an improper personal benefit, unless said transaction was with the informed consent of the Member or a majority of the disinterested Managers.

SECTION 4.3. Indemnity. The Company shall indemnify any Member, Manager, agent or employee, past or present, of the Company (an "Indemnified Person") to the full extent permissible pursuant to Section 7-16-4(11) of the Act; provided, however, that the Company shall not indemnify any Indemnified Person for:

(1) breach of the Indemnified Person's duty of loyalty to the Company or its Member;

(2) acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law;

(3) the liability imposed pursuant to the provisions of Section 32 of the Act relating to wrongful distributions; or

(4) any transaction from which the Indemnified Person derived an improper personal benefit, unless said transaction was with the consent of the Member or a majority of the disinterested Managers.

ARTICLE V.

TRANSFER OF INTERESTS

SECTION 5.1. Transfer of Interests. The Member may transfer its Interest at such time, in such amount and pursuant to such terms, in whole or in part, as the Member shall in its sole discretion determine.

ARTICLE VI.

DISSOLUTION, WINDING UP AND LIQUIDATING DISTRIBUTIONS

SECTION 6.1. Dissolution Triggers. The Company shall dissolve only upon the first to occur of any of the following events:

(a) Upon determination by the Member to dissolve the Company.

(b) The entry of a decree of administrative dissolution under the Act.

SECTION 6.2. Winding Up. Upon dissolution of the Company, the Manager shall wind up the Company's affairs.

SECTION 6.3. Liquidating Distributions. Following the dissolution of the Company, the assets of the Company shall first be applied to satisfy claims of creditors, with any balance being distributed to the Member in liquidation as provided in the Act.

ARTICLE VII.

BOOKS AND RECORDS

SECTION 7.1. Books and Records. The Company shall keep books and records at its principal place of business, which shall set forth an accurate account of all transactions of the Company and which shall enable the Company to comply with the requirement under Section 1.6 above that it segregate and account for its assets and liabilities separately from those of the Member.

ARTICLE VIII.

MISCELLANEOUS

SECTION 8.1. Binding Effect. Except as otherwise provided in this Agreement, every covenant, term and provision of this Agreement shall be binding upon and inure to the benefit of the Member and its successors, transferees, and assigns.

SECTION 8.2. Construction. Every covenant, term and provision of this Agreement shall be construed simply according to its fair meaning and not strictly for or against the Member. No provision of this Agreement is to be interpreted as a penalty upon, or a forfeiture by, any party to this Agreement.

SECTION 8.3. Entire Agreement: No Oral Operating Agreements: Amendments. This Agreement constitutes the entire agreement with respect to the affairs of the Company and the conduct of its business, and supersedes all prior agreements and understandings, whether oral or written. The Company shall have no oral operating agreements. This Agreement may only be amended by a written instrument executed by the Member.

SECTION 8.4. Headings. Section and other headings contained in this Agreement

are for reference purposes only and are not intended to describe, interpret, define or limit the scope, extent or intent of this Agreement or any provision hereof.

SECTION 8.5. Severability. Every provision of this Agreement is intended to be severable. If any term or provision hereof is illegal or invalid for any reason whatsoever, such illegality or invalidity shall not affect the validity or legality of the remainder of this Agreement.

SECTION 8.6. Variation of Pronouns. All pronouns and any variations thereof shall be deemed to refer to masculine, feminine or neuter, singular or plural, as the identity of the Person or Persons may require.

SECTION 8.7. Governing Law. The law of the State of Rhode Island, without regard to its conflicts of law principles, shall govern the validity of this Agreement, the construction and interpretation of its terms, and organization and internal affairs of the Company and the limited liability of its Managers, Members and other owners.

SECTION 8.8. Exhibit A. Exhibit A to this Agreement contains a Glossary of Terms which is hereby incorporated by reference.

[SIGNATURE PAGE TO FOLLOW]

IN WITNESS WHEREOF, the Member has executed this Agreement effective as of the date first above written.

NEW ENGLAND RADIATION THERAPY MANAGEMENT SERVICES, INC.

By: _____
Name: Bryan J. Carey
Title: Vice President

EXHIBIT A

GLOSSARY OF TERMS

"Act" shall mean Chapter 16 of Title 7 of the General Laws of Rhode Island, 1956, as amended, as the same may be amended from time to time.

"Agreement" shall mean this Operating Agreement, as amended from time to time.

"Articles of Organization" shall mean the articles of organization required to be filed by the Company pursuant to the Act together with any amendments thereto.

"Capital Contribution" shall mean with respect to the Member, the amount of money and any property (other than money) contributed to the Company with respect to the Interest of such Member.

"Code" shall mean the Internal Revenue Code of 1986, as amended from time to time, or any successor federal revenue law.

"Interest" shall mean all of the rights, privileges, preferences and obligations of the Member or its assignees with respect to the Company created under this Agreement or under the Act.

"Person" shall mean any natural person, partnership, trust, estate, association, limited liability company, corporation, custodian, nominee, governmental instrumentality or agency, body politic or any other entity in its own or any representative capacity.