WHITE PAPER

Radiation Therapy Safety: The Critical Role of the Radiation Therapist

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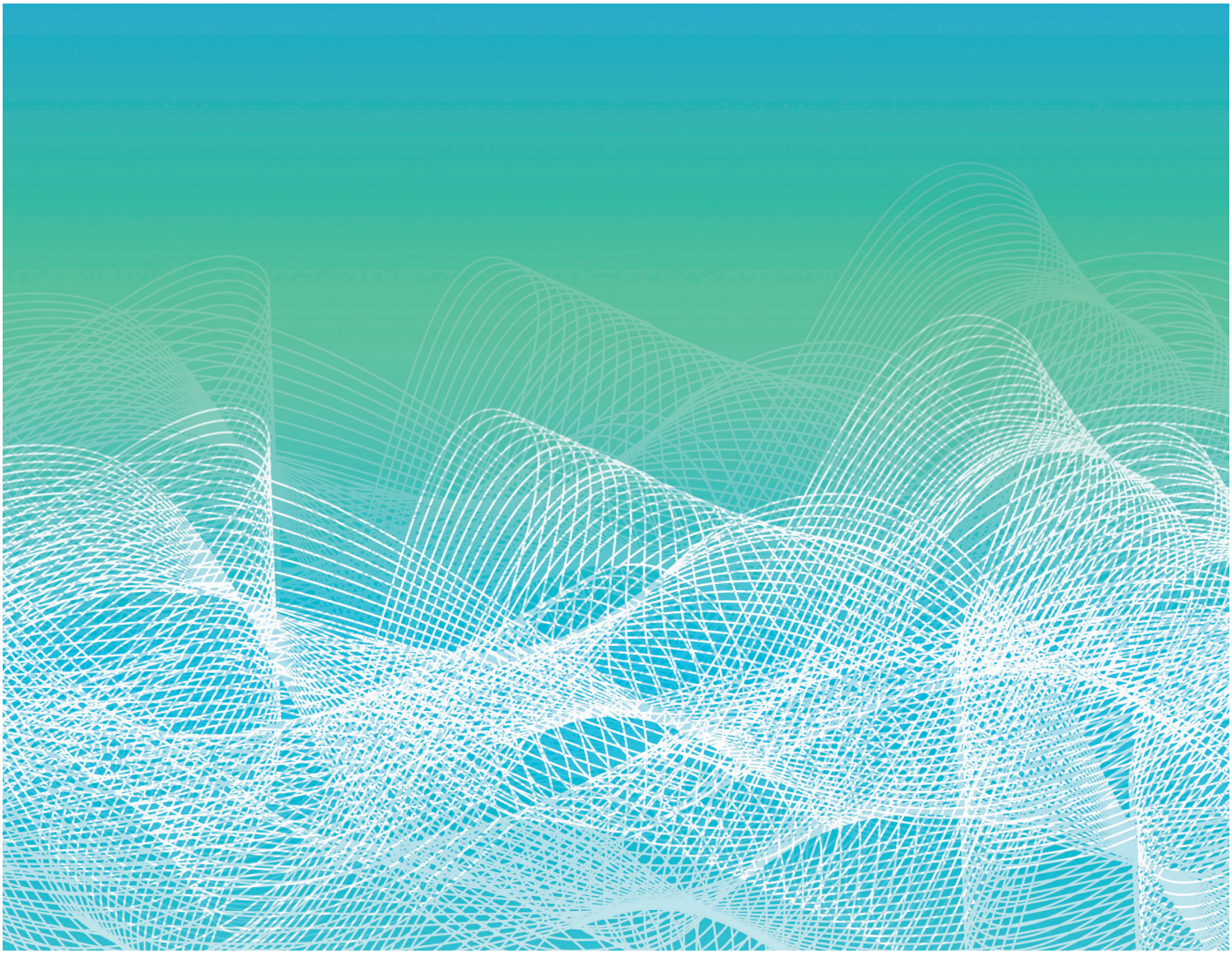
for the ASRT Education and Research Foundation Health Care Industry Advisory Council
Subcommittee on Patient Safety and Quality in Radiation Therapy



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Nearly 1.6 million people in the United States were diagnosed with cancer in 2011 and about two-thirds of these patients likely received radiation therapy treatments during their illnesses.[1,2] Most radiation treatments occur without incident and contribute to the comfort or cure of cancer patients.[3] Still, advances in technology that provide more sophisticated, promising and accurate techniques for targeting malignancies come with a price: complex technology that requires extensive training, continuing education and attention from the radiation therapists who deliver the radiation.

The consequences of a single error are enormous, as outlined by feature articles in *The New York Times* beginning in 2010.[4,5] These and other reports, such as the ECRI Institute (formerly Emergency Care Research Institute) naming of radiation therapy errors as the number one hazard in health care,[6] have focused public, professional and regulatory attention on radiation oncology processes, equipment and delivery of care. Professional organizations, vendors and providers are responding to address the challenges faced by ensuring that all of the tools for learning and improving processes are in place to prevent, detect and correct radiation therapy-related errors.

Background

The American Society of Radiologic Technologists (ASRT) is a professional membership organization representing more than 144,000 medical imaging technologists and radiation therapists. The organization provides educational opportunities to members, promotes the radiologic science profession and monitors legislation affecting the profession. In addition, ASRT establishes standards of practice and develops education criteria for medical imaging and radiation therapy professionals.[7]

The ASRT Education and Research Foundation, the philanthropic arm of the ASRT, accepts donations from individuals and organizations to fund research and scholarships. The Foundation supports and empowers professionals in medical imaging and radiation therapy professions to pursue opportunities that improve patient care. One method to accomplish this goal is through partnering with the industry to improve medical imaging technologist and radiation therapist education, job performance and patient care. The Foundation's Health Care Industry Advisory Council (HCIAC) includes representatives of important companies in the radiology and radiation oncology industries who work together in a noncompetitive environment to advance patient care.[8] Members meet annually, and occasionally form subcommittees to discuss significant issues in the radiologic sciences. The Subcommittee on Patient Safety and Quality in Radiation Therapy met November 14, 2011, in Albuquerque, N.M. Committee members in attendance are listed in Appendix A.

Committee Purpose

HCIAC member organizations recognize the importance of working together for the good of the patient.

Patient care and safety remain at the forefront of radiation therapist ethics and practice standards, and safe and effective design, manufacture and operation of radiation oncology equipment remain constant goals for HCIAC member organizations. However, events such as media reports brought these matters to the surface beginning in January 2010. The Subcommittee on Patient Safety and Quality in Radiation Therapy met in light of these events, but also because of numerous challenges regarding radiation oncology care and commitment to the role of the radiation therapist in patient care.

There has been a heightened perception of medical safety among professionals and the public over the past decade, with mixed perception regarding patient safety in radiation therapy.[9] When *The New York Times* featured stories of serious radiation overdoses,[5] the errors raised fears in the public — and in patients slated to receive radiation therapy. In addition, the complexity of the technology used to deliver radiation treatments has increased exponentially in recent years. This is good news for patients, but only if personnel who maintain and operate the equipment and plan the treatments remain up-to-date on the advances and the skills necessary to work within the technological environments the new modalities and machines require.

These and other factors brought together the subcommittee of concerned radiation therapists, managers and representatives of radiation therapy equipment vendors to discuss the issue in detail and consider cooperative and workable solutions focusing primarily on the areas they represent: the role of the radiation therapist and the support provided to therapists and other radiation oncology staff from equipment vendors.

Industry Response

Several professional organizations responded immediately to the articles in *The New York Times,* including the ASRT. In a letter to the newspaper's editor, then-president Diane Mayo, R.T.(R)(CT), reminded readers that although radiation therapy errors are tragic, they are rare. She also pointed out that in 2010, 17 states did not require a license to deliver radiation therapy.[10] Many organizations also were asked to testify before the U.S. House of Representatives Energy and Commerce Committee's Subcommittee on Health. ASRT was among these, and was represented by Sandra Hayden, MA, R.T.(T), a member of the ASRT Board of Directors and administrative director of radiation therapy services at the University of Texas, MD Anderson Cancer Center in Houston.

Hayden emphasized that establishing national education and certification standards for technical personnel who perform radiation therapy procedures was the best way to ensure quality and safety of the procedures. She mentioned that the solution lies in the Consistency, Accuracy, Responsibility and Excellence in Medical Imaging and Radiation Therapy (CARE) bill before the House. Hayden and the ASRT also called for establishment of consistent and mandatory methods of reporting medical radiation errors.[11] Other organizations, such as the American Association of Physicists in Medicine (AAPM), the American Society for Radiation Oncology (ASTRO) and the Medical Imaging and Technology Alliance (MITA) have made statements, published white papers or developed initiatives to address safety in radiation therapy.[9,12,13]

Scope of White Paper

This White Paper also is a response — as commissioned by the ASRT Foundation and the HCIAC — on behalf of the radiation therapy profession and the industry's equipment vendors, particularly representatives of the companies' education services. The goal of the document is to provide background on the radiation therapist's role in safe treatment delivery, an overview of the challenges faced by therapists in delivery of care and challenges faced by vendors and sites in appropriately training providers on use of clinical equipment. The paper also outlines best practice scenarios and recommendations for radiation therapists, their leadership and industry. The committee's evaluation and recommendations are categorized according to: skills assessment, applications training and support, workplace culture and workplace staffing.

This document is the direct result of collaborative discussions of the radiation therapists represented from practice and industry who serve on the HCIAC Subcommittee on Patient Safety and Quality in Radiation Therapy and has been reviewed and accepted by its members.

Workplace Staffing

Radiation helps treat cancer and select other diseases by destroying cells. When radiation damages cancer

cells' DNA, it affects the cells' ability to continue reproducing. By nature, cancer cells divide rapidly, which makes them particularly susceptible to radiation.[14] Delivering ionizing radiation to patients to target specific cells requires unparalleled accuracy. Too little radiation can allow cancerous cells to regrow, but too much radiation — or missed targets — can harm the patient.

Ensuring consistent, accurate and effective radiation treatment requires cooperation of a team of radiation oncology specialists: radiation oncologists, medical physicists, radiation therapists, medical dosimetrists and nurses. Radiation therapists are responsible for delivering the radiation treatments. To prepare for this role, a radiation therapist successfully completes an accredited educational program in radiation therapy and attains certification in the specialty from the American Registry of Radiologic Technologists (ARRT).

Accredited radiation therapy education options include a certificate, associate or bachelor's degree program. Programs focus on physics, radiation safety, anatomy and patient care and prepare students for the national certification examination administered by the ARRT. To maintain certification, ARRT-registered radiation therapists are required to complete appropriate continuing education to sustain a level of expertise and remain aware of changes and advances in radiation therapy practice.[15] In general, this involves completing 24 hours of continuing education in approved activities every two years.[16]

The ARRT does not license therapists, however, and states' education requirements regarding radiation therapist licensing vary. As of February 2012, 15 states did not regulate radiation therapists. As pointed out in Hayden's report to Congress on behalf of ASRT, hairdressers are better regulated in some states than people who perform medical radiation procedures.[11] Yet radiation therapists must maintain high degrees of accuracy when delivering treatment, think critically, and at times use independent, professional and ethical judgment in every aspect of their work. Though members of a team that is supervised by radiation oncologists, therapists review protocols, operate increasingly sophisticated equipment, monitor and assess patients and initiate treatments that can extend for several weeks.[15] In effect, there are no requirements regarding education and expertise for radiation therapists in states that have no licensing regulations; it is up to hiring managers at facilities to set and enforce minimum qualifications for radiation therapists and medical dosimetrists.[17]

Despite lack of regulation, accreditation programs for radiation oncology recommend that radiation therapists have ARRT certification.18 Still, the CARE bill (H.R. 2104) remains stalled in the U.S. House of Representatives.[19]

Accreditation programs also address staffing of radiation therapy, recommending a minimum of two therapists per active linear accelerator regardless of patient volume, and more therapists based on the annual number of new patients at a facility and ratio of procedures performed.[18] One example, intensity-modulated radiation therapy (IMRT), has improved the radiation oncology team's ability to conform isodose distributions more precisely to targets' shapes, which reduces dose to adjacent structures. The planning and delivery of radiation under this newer technology is more complex, however, than with conventional linear accelerator procedures.

In fact, since 3-D treatment planning began in the 1980s, the workflow processes associated with radiation therapy have become increasing complex. IMRT introduced highly conformal doses and dose gradients much sharper than those possible with previous technologies.[20] Advanced technologies such as IMRT have improved treatment of a number of cancers by better compensating for irregular or concave tissues, along with those close to or largely surrounded by normal tissues.[21,22]

Radiation therapists always have had to review all approved treatment plans, instructions, prescriptions and images to ensure that the information is consistent and valid before delivering any treatment. The evolution of radiation treatments to more complex planning and targeting, including, but not limited to IMRT, requires an ever-vigilant approach to quality assurance. QA must be performed, documented, verified and approved before treatments proceed. This includes a time-out before turning the x-ray beam on so that therapists can verify patient identity and target isocenter; the time-out is more complex and lengthy the more dynamic the treatment. Keeping with the IMRT example, time-out verifications are more complex and lengthy than for traditional linear accelerator procedures. Radiation therapists must obtain, review and seek approval for images taken for all patients' treatments according to the department's policies and procedures,

along with approved treatment plans, instructions and prescriptions. Therapists monitor the patient and treatment conditions for inconsistencies or irregularities and notify physicists if any problems arise; they also stop treatments when problems occur.[23]

Although continued advances that improve accuracy and effectiveness of treatment delivery while minimizing normal tissue damage are crucial to patients who receive radiation therapy, QA policies and procedures — along with time and system support for those procedures — must progress along with the development of ever more complex treatment options. Increasing demands from QA naturally demand more attention from radiation therapists administering treatments, and are critical to safety. The increasing demands must not sacrifice patient care, and must be considered in staffing decisions.

In a 2010 survey of the radiation therapist and dosimetrist workforce, the ASRT found that most radiation therapists reported that exactly two therapists per linear accelerator routinely were scheduled at their facilities. About 18 percent reported having three therapists per treatment machine, yet about 41 percent of these facilities reported routinely scheduling one therapist per linear accelerator between one and eight hours a day. Most of these instances were for one-hour periods, but 10 percent of facilities responded that only one therapist staffed a treatment machine for eight hours each day.[24] One therapist always should be attentive to the patient, and another to the treatment console. A minimum of two therapists per machine at all times ensures they can perform and remain attentive to the console and patient should a third or rotating therapist be called away to perform a simulation, find files, assist a patient with psychosocial needs, communicate with other members of the health care team, perform QA activities or answer the telephone. In addition, two therapists always should be available in the event of emergencies and as a "second set of eyes" to verify information during time-outs for procedures.

Though costs often are cited as the reasons staffing ratios are maintained at minimum levels possible, leadership should be reminded of the cost — not only to patients, but in real settlements and litigation — of lawsuits brought against radiation oncology providers because of errors. The costs of settlements for the cases described in *The New York Times* were not revealed, but the public relations costs were extremely high.[4]

Best Practices:

- All radiation therapy is delivered only by ARRT-registered radiation therapists.
- All sites providing radiation therapy staff at the level of two therapists per machine at all times.

Recommendations:

- ASRT will continue to support the CARE bill and other efforts to ensure registered radiation therapists deliver care.
- Sites should evaluate workflow and staffing levels to determine whether (and when) fewer than two therapists staff each machine and correct as soon as possible.

Workplace Culture

The radiation therapist is the ultimate gatekeeper in the delivery of curative doses of radiation. As such, all members of the treatment team must recognize the therapist's critical role in safeguarding the patient. Doing so requires that radiation therapists and others on the radiation oncology and health care teams view therapists as professionals and embrace a culture that strongly supports safety.

In a report on IMRT safety considerations, Moran and colleagues suggested several considerations to support a culture of safety, including trust among department members, event tracking, review and follow-up, hiring and ongoing training of personnel, use of standard operating procedures, defining each team member's roles and responsibilities and effective communication among team members.[13]

Administrators can set the tone for safety and professionalism in radiation oncology facilities. They do so by openly supporting error prevention and reporting. This includes encouraging team members to report errors and near misses and providing the tools, training and time for reporting by ensuring there are processes and equipment in place for tracking errors and adequate staffing to allow therapists and other team members time to complete the processes.[23] Mutic and colleagues found that by specially designing electronic event reporting systems, staff were more likely to report errors and near misses because work disruption was minimal.[25] When the Johns Hopkins Hospital implemented a voluntary incident reporting system, most of

the events were logged by radiation therapists and none were logged by physicians.[3]

A survey conducted in spring 2011 by Robert Adams, EdD, MPH, R.T.(R)(T), of the University of North Carolina, questioned 250 radiation therapists throughout the United States regarding error rates and barriers to reporting. Although most radiation therapists reported good communication with dosimetrists, department administrators and radiation oncologists in particular, only 78 percent strongly agreed that they are encouraged to report clinical errors. In addition, 16 percent of radiation therapists surveyed reported that they have been reprimanded by their superiors for reporting clinical errors. Fear of reprimand is the greatest barrier to error reporting, cited by 29 percent of those surveyed as the top barrier.[26] In fact, all team members must be able to communicate openly and feel comfortable challenging one another regarding safety and quality issues, or freely asking questions throughout the process, without reprisal.[23]

The culture shift begins, however, with radiation therapists, who must continually promote and practice within the profession's standards and ethics. Taking the initiative to learn about new advancements in technology is an example of promoting one's professionalism. When it comes to patient safety and error reporting, radiation therapists must take the time to perform time-outs and double-checks — and trust one another as well as all members of their teams. A culture of professionalism and patient safety requires radiation therapists to be able to inherently say or believe "I trust you and your work, but I am double-checking it; I expect you to do the same for me."

Promoting safety and professionalism also means minimizing distractions while delivering treatments. In the ASRT workplace survey, the primary distraction in the clinical setting for radiation therapists (at 28.4 percent) was interruptions from other people such as nurses, physicians or fellow therapists.[24] Discussions from other professional societies have cited interruptions from staff members, crowded workstations, and Internet availability as sources of distraction.[3] Radiation therapists and other team members should work together to develop policies, procedures, communication standards and — if necessary — physical barriers or reminders to minimize distractions while radiation therapists are treating patients and the beam is on.

The report by Moran and colleagues also added ACR/ASTRO accreditation and continuing improvement activities as supportive of safety.[13] These programs recognize existing standards and ethics in radiation oncology professions designed to ensure a culture of professionalism and patient safety. For example, the ARRT rules of ethics for radiologic technologists include possible sanctions for any radiation therapist who fails "to immediately report to his or her supervisor information concerning an error made in connection with imaging, treating, or caring for a patient."[27] The rules include departures from the standards of care that could be harmful, unethical or improper, along with negligent behavior. Therapists have an ethical duty to report regardless of whether the patient is harmed.[27]

The ASRT Practice Standards for Medical Imaging and Radiation Therapy also clearly outline that radiation therapists determine, because of safety concerns, "when to withhold treatment until a licensed independent practitioner is contacted." The therapist also is expected to identify exceptions to expected outcomes and develop revised action plans, and during therapy administration, to report deviations from the standard or planned treatment. When documenting treatment data, the therapist also is expected to document exceptions from the established criteria or procedures.[15]

Radiation therapists should be encouraged to document all errors and exceptions, along with all attempts to correct deviations from standards of care or planned treatments. They also should be involved in continuous improvement activities to suggest ways to ensure patient safety. Meetings of organizations such as AAPM and ASTRO have cited the absence of defined policies and procedures to define team member roles, along with empowerment of staff, as impediments to patient safety.[3] Therapists should practice within their scope of practice and follow their standards of practice and rules of ethics by reporting appropriate events, and they should continue to enhance the perception of their professionalism by participating in lifelong learning, research and publishing opportunities.

As administrators establish cultures that encourage safety and radiation oncology organizations develop and improve error reporting and tracking systems, it is imperative that radiation therapists feel they can report errors and near-misses — according to the standards and

ethics that guide their profession — without fear of negative repercussions. Any reporting system is only as strong as its accurate and consistent participation. These systems will be successful if administrators and other members of the radiation oncology team approach reports of errors and exceptions as opportunities for improvement rather than reprimand. Error reporting should not be tied to performance evaluation. Mutic and colleagues at Washington University School of Medicine use their Web-based reporting structure as the basis for formal process improvement in patient safety.[25]

Best Practices:

- Administrators, radiation oncologists, radiation therapists and all oncology staff members embrace a culture that supports radiation therapist professionalism.
- Radiation therapists and other radiation oncology professionals adhere to professional ethics and standards of practice established by their professions.
- Reporting of errors is expected and encouraged.

Recommendations:

- ASRT and its members continue to support efforts to develop consistent and mandatory error reporting.
- Radiation therapy site managers should implement changes to encourage reporting of errors and near-misses and investigate a systematic approach to error reporting, tracking and correction.
- Radiation therapists should embrace a comprehensive approach to professionalism that includes lifelong learning, error reporting and process improvement.

Skills Assessment

Medical care improves because of dedicated providers and advances in technology. Radiation therapy is no exception to this rule. IMRT, image-guided radiation therapy (IGRT) and stereotactic radiosurgery are recent examples of improved care that rely on complex technology.

For example, approximately 90 percent of respondents to the ASRT workplace survey said their facilities provided IMRT and computed tomography (CT) simulation. Nearly 80 percent had IGRT services.[24] The procedure radiation therapists reported they were least prepared to perform was CT simulation.[24] These simulations require working knowledge of CT, and although CT simulation is included in the radiation therapy education curriculum, new technologies add complexity that can require additional skills. Less than 3 percent of radiation therapists held additional CT certifications.

When radiation therapists and other members of the treatment team work at facilities installing new equipment, they must be prepared with the basic knowledge required to work on the new modality before the equipment vendors arrive to install the equipment and train staff on its proper operation. An example is IMRT. Additional training specific to IMRT is critical before beginning work with the modality.[13] Educational programs designed by national organizations and methods to test readiness for IMRT are available to sites.[23] These matters are important to radiation therapy professionalism and patient safety regardless of new equipment installations. What's more, if radiation therapists do not understand the basics of the technology and modality before the equipment arrives, applications trainers cannot focus on the task at hand: specific function and safe, effective operation of the newly installed system.

The skills of recently hired and temporary staff also can vary in radiation oncology facilities and should be a primary concern for administrators as part of the safety and quality culture. Competency checklists for new and temporary staff help ensure that all radiation therapists are prepared to perform procedures specific to a site; they also help ensure that staff members are ready for applications training from vendors. Much like procedural checklists — which have been shown to improve safety in several disciplines[23] — checklists to assess readiness for working on new equipment could prove to be objective and thorough tools for administrators.

Administrators can work together with applications trainers to prepare brief quizzes for core competency preassessment and postassessment that determine staff readiness for training. For example, cross-sectional anatomy is important for many new radiation therapy modalities. These assessments should meet administrators' goals for education of staff, along with the goals set by vendors for safe and effective operation of their products. Most vendors currently conduct preassessments and postassessments as part of end-user applications training,[28] but

assessments conducted by on-site managers working in concert with vendors would be most effective.

Some facilities perform peer assessment, along with assessments from physicists and chief therapists or administrators, to ensure radiation therapists are ready to take on all clinical tasks required of them in the practice environment and are up-to-date on the depth of increasingly complex technology. Chart checks ensure that therapists are following standard operating procedures and practices, and small facilities can help check across disciplines or work with similar, noncompeting facilities to periodically provide informal peer review. Tiered responsibilities or user-right levels can help ease new staff into the site's modalities and operating procedures. For example, a new or temporary therapist might not be allowed to work alone for a period of 30 days or have user rights that limit the parameters he or she can modify or enter until reassessment.

Organizations such as ACR and AAPM have begun facilitating peer-to-peer review to share best practices. These confidential evaluations use valid assessment tools from outside reviewers, and focus on safety and continuous learning.[3] This sort of peer assessment could help minimize problems associated with communication and fear of reprisal among staff — a radiation therapist might favor review from another therapist if he or she does not work side-by-side with the therapist every day. Peer-to-peer review is meant to be an ongoing program that is part of continuous improvement.

Often, applications training or continuing education activities are viewed as "events." As part of workplace culture shifts, administrators, radiation therapists and the entire radiation oncology team should view training and continuing education as an ongoing process. In fact, participating in continuing education "to maintain and enhance competency and performance" is inherent in the radiation therapy professional performance standards. Pursuit of lifelong learning and adoption of best practices also are among therapist standards of practice.[15]

Post-training assessments and competency assessments, along with periodic re-assessments, should be viewed as opportunities to learn and help staff grow, not as disciplinary situations. Assessments managed by administrators and supervisors should be performed systematically as part of a site's policies and procedures. Documentation of staff competency proves helpful for accreditation programs such as The Joint Commission.

The ARRT implemented a new approach to maintenance of registration that applies to radiation therapists certified beginning January 1, 2011. The continuing qualifications requirements eventually will include an assessment specific to practice every 10 years.[29] A program — planned for implementation in 2012 — will offer online self-assessment so that therapists can plan continuing education according to any identified weaknesses.

Best Practices:

- Employers conduct preassessments of radiation therapist skills before beginning applications training and postcompetency assessments following training.
- Radiation oncology providers conduct ongoing peer-to-peer assessment.

Recommendations:

- All radiation oncology sites installing new equipment or upgrades should work with applications trainers to develop and implement checklists for preassessment and postassessment of radiation therapists' skills.
- Therapists should use the assessments as a method for identifying gaps in skills and knowledge and seek opportunities for continued professional development in these areas.

Applications Training and Support

The media reports cited in this document and many others outlining serious errors at a few radiation therapy facilities focused on people, procedures and the technology used to deliver the radiation.[5] Most importantly, mistakes occurred when members of the treatment teams did not work in concert with the technology to avoid or correct costly errors that caused patient harm.

In the past 20 years, linear accelerators and treatment planning have become much more complex, and radiation oncology sites and team members must adjust processes, policies, procedures and learning accordingly. There also are several challenges for sites and trainers in providing applications training. Among these are time constraints vs increased time requirements to cover complex modalities, along

with inconsistent commitment to training on the part of staff and management.[28] In addition, sites often are not prepared for installations and logistical aspects of training. The goal of applications training is to provide the highest quality care for radiation oncology patients, and to ensure that staff members are competent and comfortable with new technologies in their departments to safely operate the equipment. This requires having radiation therapists who are thoroughly and completely trained on the equipment, so that they are prepared to provide safe and quality care for patients in their facilities. Too often, however, applications training is viewed not only as an "event," but as an interruption to staff schedules and a drain on productivity and revenue.

In creating a culture that focuses on safety and professionalism, all radiation oncology sites installing and updating equipment should consider applications training a requirement for staff rather than an option. In the ASRT's survey of the radiation therapy workplace, more than 90 percent of managers reported that they have the latitude to facilitate time for training activities.[24]

In the current state, however, busy staff in revenue-strapped radiation oncology departments seldom find — or make — time to attend entire applications training sessions. Even when good intentions result in scheduled time for staff to attend, problems occur that pull many away from important sessions. In addition, employees come and go, affecting training continuity and effectiveness. Aside from issues regarding readiness for training, some radiation therapists and other members of the radiation oncology team miss critical portions of programs or training schedules get behind because a few participants have to catch up to others.

Radiation oncology sites and radiation therapists are accountable to attend and be engaged in applications training as a critical part of their missions to provide safe, quality patient care. Vendors and their applications trainers are accountable to provide effective and thorough training programs. Follow-up after applications training also is the joint responsibility of vendors and site leadership. Although vendors should provide information while on site and be available following training to answer questions and problem-solve according to purchase agreement terms, planning of follow-up training is the responsibility of the site.

Under a culture that emphasizes quality and patient safety, time spent on applications training is viewed as "safety time." Although the site might not be able to provide patient care and bill for services during scheduled down time for training, radiation oncology is different from other medical services in that treatment is ongoing. When planned ahead, patient schedules can be adjusted; revenue is delayed rather than lost, and patient care is not affected if treatment interruptions are brief and planned for training purposes. On the other hand, radiation therapists always work to minimize frequent interruptions to treatments. Yet a potential outcome of poorly planned and attended or executed applications training could be just these types of interruptions, resulting from help needed should problems arise because staff attended intermittently or assessments did not adequately ensure staff understood how to handle unusual situations that occur. Organization, planning and preparation help ensure that application installs and training run smoothly, which can save time. The IMRT white paper on safety considerations in IMRT also states that "administrators should allow time and provide financial support for training with new equipment, prior to the use of the equipment for patient treatments."[23] There is potential danger in shortcutting applications training, and potentially improved return on investment for appropriately conducted training.

Contracts can ensure that site managers and vendor representatives are clear on accountabilities, responsibilities and preparation for applications training. They help reinforce the concept that vendors, sites and staff share ownership and accountability in facilitating successful training and creating the opportunity for training and full engagement in applications training activities. Checklists from vendors help sites better prepare for installation and training to minimize delays and scheduling problems. In addition, applications training usually includes only how to work the equipment when all goes as planned. Thorough training should involve built-in error points, in which trainees must problem-solve and correct errors on the new equipment.

Many facilities have installations from more than one vendor or an equipment upgrade that affects the operation of another piece of equipment made by the same vendor or another vendor. Radiation therapists,

administrators and other team members can be faced with multiple calls or trainings relevant to equipment, and can be subjected to mixed messages or confusion when trying to resolve equipment performance problems related to cross-vendor systems. Providers and vendors would benefit from improved cooperation among vendors when testing, training and supporting radiation therapy systems. Multivendor training events would be desirable over separate events, although multivendor events can be difficult to coordinate.

In its white paper on IMRT safety, an appointed ASTRO committee emphasizes that improvements in IMRT equipment and methods to enhance patient safety "would be facilitated by collaborative efforts between vendors, user and regulatory agencies."[23] The HCIAC subcommittee on radiation therapy agrees with the ASTRO committee that each of these groups has important information about radiation therapy safety, but that no single group can resolve the problem of catastrophic errors alone. The same holds true for solving issues regarding applications training and ongoing support: Collaboration is key.

Best Practices:

- Radiation therapy managers, radiation therapists and vendor representatives work together to help ensure successful implementation and training for sites purchasing new radiation therapy equipment.
- Vendors cooperate to improve multivendor implementation, training and support for radiation therapy sites.

Recommendations:

- HCIAC Subcommittee on Patient Safety and Quality in Radiation Therapy will spearhead efforts to provide guidelines for successful radiation therapy equipment installation and training, including preparedness and competency checklist suggestions.
- All HCIAC member companies should conduct additional multivendor prerelease and testing and explore possible multivendor training, along with cross-vendor support systems for help desks and online support groups.
- Sites installing equipment cooperate with vendors to support successful and complete installation and appropriate, uninterrupted and complete training of all radiation therapy staff to ensure safe, quality patient care.

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Appendix A

ASRT Foundation Health Care Industry Advisory Council Subcommittee on Patient Safety and Quality in Radiation Therapy Members

- Carrin Brooks, R.T.(R)(T), Oncology Care Education Specialist, Siemens Healthcare.
- Kim Gehrin, R.T.(R)(T), Vice President of Training and Media Services, Elekta Inc.
- Sandra Hayden, MA, R.T.(T), Director of Radiation Therapy Services at the University of Texas, MD Anderson Cancer Center in Houston, Texas, and member of ASRT Board of Directors.
- David Leary, R.T.(R)(T), Clinical Education Specialist, Siemens Medical Solutions USA Inc.
- Sue Merritt, R.T.(T), Senior Manager, Clinical Training for the Americas, Varian Medical Systems.
- Cheryl Mooney, MEd, R.T.(R)(T)(M),CMD, Manager, Clinical Standards and Content, Varian Medical Systems.
- Karen Reed, R.T.(R)(T), Manager, Oncology Clinical Applications, Elekta Inc.
- Kevin Rush, MHA, R.T.(R)(T), FASRT, Director of Cancer Radiation Centers at Indiana University Health Bloomington Hospital, and member of ARRT Board of Directors.

Appendix B

Summary of Best Practices and Recommendations

Workplace Staffing

Best Practices:

- All radiation therapy is delivered only by ARRT-registered radiation therapists.
- All sites providing radiation therapy staff at the level of two therapists per machine at all times.

Recommendations:

- ASRT will continue to support the CARE bill and other efforts to ensure registered radiation therapists deliver care.
- Sites should evaluate workflow and staffing levels to determine whether (and when) fewer than two therapists staff each machine and correct as soon as possible.

Workplace Culture

Best Practices:

- Administrators, radiation oncologists, radiation therapists and all oncology staff members embrace a culture that supports radiation therapist professionalism.
- Radiation therapists and other radiation oncology professionals adhere to professional ethics and standards of practice established by their professions.
- Reporting of errors is expected and encouraged.

Recommendations:

- ASRT and its members continue to support efforts to develop consistent and mandatory error reporting.
- Radiation therapy site managers should implement changes to encourage reporting of errors and near-misses and investigate a systematic approach to error reporting, tracking and correction.
- Radiation therapists should embrace a comprehensive approach to professionalism that includes lifelong learning, error reporting and process improvement.

Skills Assessment

Best Practices:

- Employers conduct preassessments of radiation therapists' skills before beginning applications training and postcompetency assessments following training.
- Radiation oncology providers conduct ongoing peer-to-peer assessment.

Recommendations:

- All radiation oncology sites installing new equipment or upgrades should work with applications trainers to develop and implement checklists for preassessment and postassessment of radiation therapists' skills.
- Therapists should use the assessments as a method for identifying gaps in skills and knowledge and seek opportunities for continued professional development in these areas.

Applications Training

Best Practices:

- Radiation therapy managers, radiation therapists and vendor representatives work together to help ensure successful implementation and training for sites purchasing new radiation therapy equipment.
- Vendors cooperate to improve multivendor implementation, training and support for radiation therapy sites.

Recommendations:

- HCIAC Subcommittee on Patient Safety and Quality in Radiation Therapy will spearhead efforts to provide guidelines for successful radiation therapy equipment installation and training, including preparedness and competency checklist suggestions.
- All HCIAC member companies should conduct additional multivendor prerelease and testing and explore possible multivendor training, along

with cross-vendor support systems for help desks and online support groups.

- Sites installing equipment cooperate with vendors to support successful and complete installation and appropriate, uninterrupted training for all radiation therapy staff to ensure safe, quality patient care.