Staffing Issues Related to IMRT

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Implementing a new IMRT program requires careful consideration of staffing needs. Successful IMRT departments have a skilled physics and dosimetry staff as well as skilled radiation therapists. At least one full-time equivalent physicist and a half-time dosimetrist must be available before the program can begin, and another half-time physicist is often added as the IMRT patient load increases. Centers that already have multileaf collimators and administer three-dimensional conformal radiation therapy (3D-CRT) may have no additional staffing needs, but the number of new staff members will depend on the number of cases the clinic plans to treat.

Training time should also be considered. IMRT training courses can keep physicists and dosimetrists away from the center for a week at a time, causing a significant disruption in patient flow.

THE IMRT TEAM

The medical physicist, dosimetrist, radiation therapist, and physician are all integral to implementing an IMRT program.

Medical Physicists. Medical physicists are certified by the American Board of Radiology, the same specialty board that certifies diagnostic and therapeutic radiologists, or by the American Board of Medical Physicists. The medical physicist collaborates with the dosimetrist on IMRT planning and performs all the quality assurance checks on the machines.

Since medical radiation equipment and software are produced in small quantities, they don't receive the thorough testing and safety checks associated with mass-produced consumer items like word processors or cars. As a consequence, flaws and computer bugs may occur. Medical physicists ensure that all the hardware and software work well together, from the moment the first CT scans are taken until patients receive their last treatment. Medical physicists have a number of other duties as well, including:

- Working with the facility's architects and the manufacturers of the accelerator, the simulator, and other equipment to make sure that the room layout satisfies federal and state regulations
- Making sure the facility meets radiation safety standards for both patients and operators
- Determining whether the accelerator and simulator are working correctly and whether they are safe for patients and operators
- Commissioning the linear accelerator and treatment planning software, which involves installing the treatment planning software and checking all phases of the treatment planning and delivery system to determine whether they are working properly. This process is performed between the time the hardware is delivered and the time the first patient is treated and takes several weeks.
- Performing regular calibration checks on the accelerator to make sure that the amount of radiation emerging from the machine precisely matches the amount the radiation oncologist has selected
- Entering calculations on the dimensions of the radiation beam into the treatment planning system computer
- Aligning the CT scanner, simulator, accelerator, and all patient positioning lasers to ensure that the tumor shown on the CT image is accurately targeted by the radiation beam
- Making sure that dropped or incorrectly transferred data do not endanger the patient
- Ensuring that software and hardware updates from the manufacturer are entered into the system
- Participating in other special procedures, such as prostate seed implantation.

Planning an IMRT treatment for a patient with a complicated head and neck cancer can take more than eight hours of a medical physicist's time. Most of the work on the linear accelerator must be done after hours or on weekends so it won't interfere with the clinic treatment schedule.

Dosimetrists. Certified medical dosimetrists (CMDs) calculate how to deliver the correct amount of radiation to the tumor site. Under the supervision of medical physicists, they generate radiation dose distributions that follow the radiation oncologist's treatment plan. Medical dosimetrists use their knowledge of physics, anatomy, and radiobiology to design optimal radiation therapy programs that target the tumor while sparing the healthy tissue around it.

Dosimetrists also perform quality assurance and constancy tests on radiation therapy equipment, design and fabricate patient positioning aids and shielding devices, manipulate radioactive sources, assist radiation oncologists during brachytherapy procedures, and prepare treatment reports for research protocols.

CMDs must complete a dosimetry or medical physics training program and have six months of on-the-

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job experience, or complete a certified radiation therapy program with two years of on-the-job experience. Annual continuing medical education credits are required to maintain CMD status.

Radiation Therapists. Registered radiation therapists (R.T.(T)s), are the medical personnel who perform treatment simulation procedures and actually administer radiation therapy treatments. They are educated in anatomy, patient positioning, examination techniques, equipment protocols, radiation safety, radiation protection, and basic patient care. Since radiation therapists see the patient more often than any other member of the oncology care team during radiation treatment, R.T.(T)s are also responsible for alerting the appropriate practitioner if the patient develops symptoms that need attention.

R.T.(T)s must complete at least two years of formal education at an accredited, hospital-based program or a two- or four-year educational program at an academic institution. They must also pass a national certification examination. To remain registered, they must earn continuing education credits on a yearly basis.

Physicians. Radiologists are physicians who complete four-year programs to become either M.D.s (medical doctors) or D.O.s (doctors of osteopathy). They then complete a four-year residency in diagnostic radiology or radiation oncology. More than 90 percent of radiologists take a standardized national examination in radiology so they can become certified by the American Board of Radiology (ABR).

Radiation oncologists are radiologists who specialize in the treatment of cancer. They consult with each patient and the patient's medical oncologist to determine the best course of therapy, then plan a treatment schedule and work with the medical physicist and dosimetrist to calculate how much radiation will be delivered.

WORKFORCE SHORTAGES

The nation's health care system is confronting a significant shortage of medical physicists, dosimetrists, and radiation therapists, and this workforce shortage should be taken into account when a health care facility wants to add IMRT to its radiation oncology program.

Medical physicists. The staffing problems in medical physics can be traced to the same source as many other difficulties facing health care today—reimbursement. Originally, radiation therapy was performed in a hospital and was paid for in a lump sum that was divided between the radiologists and the medical physicists. Medicare and private carriers paid the amount that was charged, provided the charges were "reasonable and customary." Medical physicists and radiologists were thought of as providing equal services to patients, and physicists and radiologists from that era have good memories of their close professional associations.

Medicare's push in the 1980s to contain costs strongly affected radiation oncology. Reasonable and customary charges were replaced by a rigid fee schedule and reimbursement was divided into two categories: professional charges and technical charges.

In the late 1980s, Medicare decided that medical physicists were the only medical specialists who were not providers and were therefore not entitled to payment for professional services.

Today, medical physicists' pay and benefits are rarely within the range of other medical specialists, even though profits from medical physics services are significant.

Such conditions make the field unattractive to people entering the medical professions, and today it is obvious that the pipeline has run dry. Accredited graduate programs in medical physics are only graduating about 58 new medical physicists each year. That is not good news, since about 90 medical physicists retire each year. Ten years ago an ad in an *American Association of Physicists in Medicine Placement Bulletin* typically had 20 responses, many from highly qualified, board-certified candidates. Currently, 80 medical physics positions in the U.S. are unfilled, and the majority of the few people who do apply are not board certified.

Dosimetrists. Until the advent of three-dimensional conformal radiation (3D-CRT) and CT/MRI scan fusion in the 1990s, dosimetrists received on-the-job training that usually took no more than a month. Now, the dosimetrist's job is so complex that 12 months of full-time education are required before a dosimetrist can practice.

Because the field's expansion is so recent, only a few dosimetry training programs have been established. They are very expensive to run because dosimetrists need one-on-one instruction. Moreover, since there is a shortage of medical physicists and dosimetrists, few people can be pulled out of the field to teach.

The question of liability makes the situation even more critical. As radiation fields get smaller and doses get higher, an incorrect calculation on the part of the dosimetrist can cause a patient great harm. Medical facilities cannot afford to train their own dosimetrists or hire people who have not had proper schooling when the consequences could be so severe. Until the number of training programs expands, the shortage of dosimetrists will continue.

Radiation therapists. Like dosimetry training programs, radiation therapy training programs are instructor-intensive and can only accommodate a few students a year (15 to 20). Although the specialty is well established, radiation therapy training programs are expensive to run and are some of the first programs to be cut when colleges experience budget shortfalls. In addition, in the early 1990's the field of radiation therapy was so saturated that many students had difficulty finding jobs, and many training programs closed their doors. In 1996 there were 107 radiation therapy training programs. That number fell to 71 in 2002, with a corresponding drop in the number of graduates (from 708 in 1996 to 579 in 2001).

Unlike dosimetrists, who spend their time in the physics suite and have very little patient contact, radiation therapists work with very ill patients all day long. When low salaries and the risks of radiation exposure are added to this high stress situation, it is easy to see why the field of radiation therapy may not be attractive to young people seeking careers in medicine.

EFFECTS OF THE WORKFORCE SHORTAGE

The shortage of dosimetrists and radiation therapists has affected access to treatment, the cost and quality of care, and the potential for purchasing new technology in the community setting. Some hospital-based radiation oncology departments are not able to use their simulation equipment to its fullest capacity, either because trained personnel are not available or because inexperienced therapists take twice as long to set up a patient for treatment or perform a simulation task.

The shortage has also resulted in an increased use of agency personnel. In the past, agency therapists were typically individuals who, for various reasons, could not find full-time employment in their local areas and fell back on "traveling" employment. Today, many highly qualified radiation therapists and dosimetrists have elected to work through agencies because agencies typically pay at least $10 more per hour than they can earn at a hospital or freestanding facility. Agency therapists also earn a regional per diem rate of no more than $46 per day (according to the Internal Revenue Service) plus full benefits, and agency dosimetrists can charge as much as $86 per hour plus the cost of housing and rental vehicles.

Unfortunately agencies are also having trouble finding enough qualified radiation therapists and dosimetrists to meet the demand and are hiring recent graduates without much experience. These newcomers are often placed in chaotic work environments with little supervision, and their inefficiency results in increased costs and potentially compromised patient care.

SOLUTIONS TO THE WORKFORCE SHORTAGE

Increasing salaries dramatically for radiation therapists and dosimetrists is one retention and recruitment strategy that has been successfully employed by many institutions. Salaries for radiation therapy personnel are rising faster than those for any other medical specialty (23 percent between 1997 and 2001, according to the American Society of Radiation Therapists). Today, the average national wage for an FTE certified medical dosimetrist is about $75,000, and a FTE physicist earns about $95,000. In the Dallas-Ft. Worth area, for example, annual salaries for radiation therapists increased between $2.40 and $7.70 per hour in 2001 by employers eager to retain and recruit these personnel, and sign-on and retention bonuses have become commonplace everywhere in the country.

Hospital administrators should also consider having local colleges and universities establish clinical sites for their radiation oncology training programs at the hospital. Medical facilities that have teaching programs in place do not experience the same shortages of trained radiation oncology personnel as other institutions. Our professional societies also have to do a better job of promoting the radiologic sciences to young people considering a future in medicine.

Job satisfaction in the field of radiation oncology is closely tied to the type of equipment a practitioner is forced to use, and cost containment becomes a counterproductive consideration under these circumstances. Efficient computer workstations, modern quality assurance equipment, networking capabilities between satellite facilities, and data management support in the physics suite to help cope with the steadily increasing workload will help improve the retention rate for all personnel who work in radiation therapy.

IMRT is very labor intensive. Facilities that want to add IMRT to their radiation departments should realize that they will have to hire additional staff to implement a program. They will need to budget in extra salaries, and determine how qualified people will be recruited. In this era of national shortages of radiation oncology professionals, that may be easier said than done.

Pay levels, benefits, and privileges for all radiation oncology professionals are the key to successful recruitment, boosting the field's prestige, and attracting much-needed talent into the profession. If the field of oncology intends to continue to deliver high levels of quality and service, all three strategies will have to be employed to meet the staffing needs of the future.

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