

REPORT**REPORT OF THE AMERICAN SOCIETY FOR THERAPEUTIC RADIOLOGY
AND ONCOLOGY WORKING GROUP ON THE SCOPE OF RADIATION
ONCOLOGY (SCOPE)****SCOPE STEERING COMMITTEE AND SUBCOMMITTEES****INTRODUCTION**

In 1997, the ASTRO Board of Directors set out to develop a strategic plan to make ASTRO the voice of radiation oncology in the United States. In association with this plan, the Board called on a subcommittee to define the scope of practice within our specialty. This activity was also prompted in part by recent discussions of the relative responsibilities of radiation oncologists and other caregivers at a time of unprecedented progress and change in oncology. The SCOPE effort has focused on defining the breadth of radiation oncology as a strong, viable specialty while addressing the changing health care climate (both medical and socioeconomic) that requires us to reconsider some of our skills and our responsibilities.

Writing meetings were held in the fall of 1999, and in May 2000, a draft was submitted to the steering committee. In January 2001, the draft was sent to all Board members for comment, along with 40 other experts in the oncology field. A revised draft was submitted to the Board in August 2001 and sent to ASTRO members for comment. Comments were collected at a Town Hall meeting at the November 2001 ASTRO annual meeting in San Francisco, as well as by e-mail and postal mail. These comments will be published in the September/October issue of *ASTRO News* to coincide with this publication in the Red Journal.

The report summarizes more detailed reports from four subcommittees, which may warrant circulation as appendices or as separate communications.

The main document outlines the current role of our specialty and highlights a number of issues and recommendations potentially important in preserving and enhancing the relevance and value of radiation oncology. It will represent a statement of principle, presumably with ASTRO's endorsement and deserving of subsequent discussion and debate within the Society. As aspects of the SCOPE initiative are considered and embraced by the specialty, it will be the responsibility of ASTRO, The American Board of Radiology, the Society of Chairpersons of Academic Radiation

Oncology Programs, the Residency Review Committee, and other organizations to work toward implementing them.

OVERVIEW

The day-to-day practice of medicine in the United States has changed significantly over the past decade, with a mandate for cost-effective medical care and evidence-based guideline criteria to justify standards of current medical practice (1, 2). The practice of oncology is rapidly changing and includes advances in:

- diagnostic tests, such as genetic screening and positron emission tomography (PET)
- treatments, such as monoclonal antibodies (Herceptin and Rituxan)
- new agents, including oral chemotherapeutic agents and molecular targeted treatments such as the kinase inhibitor STI-571 for chronic myelogenous leukemia
- greater emphasis on lifestyle issues such as end-of-life care, prevention, symptom management, and pain control
- increasingly sophisticated image-guided techniques for both radiation therapy and surgery, including broad introduction of functional imaging parameters
- other uses for irradiation, such as coronary artery radiation therapy (CART) and treatment of functional lesions using stereotactic brain irradiation

In the face of such a dynamic health care environment, how should the field of radiation oncology respond? How should we balance our reliance on technology with our role in overall care management? Are we training our residents broadly enough and equipping them with the skills they will need in the future? These questions prompted the Board of Directors of ASTRO to convene a committee to explore what the scope of radiation oncology might look like in the years ahead and to make recommendations on how the field should respond to a changing world. Specifically, the committee explored answers to two questions:

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chairs and the ASTRO members and colleagues in other areas of medicine who researched the respective issues and produced the key statements and recommendations.

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- What is the particular expertise and knowledge base that is within the intellectual domain of radiation oncology?
- What should be included within the purview of our specialty to foster the best interests of quality patient care and safety for the public and health care workers?

Components

The scope of radiation oncology can be defined by considering a number of issues:

1. Defining the clinical skills and knowledge base for radiation oncologists;
2. Identifying the appropriate capabilities for radiation oncology in areas such as overall patient care, including symptom management, palliative care, and end-of-life issues;
3. Establishing the role for radiation oncologists in treating nonmalignant conditions;
4. Suggesting the desirable knowledge base in the basic science of oncology and in radiation biology, as well as in clinical investigation (clinical trial design, management, and participation), new physical approaches, and informatics;
5. Outlining the role of radiation therapy in multimodality treatment.

The SCOPE Working Group complements recent and ongoing efforts of other entities that have continued to address education, training, and research:

- Society of Chairmen of Academic Radiation Oncology Programs (SCAROP): Training the Radiation Oncologist for the Twenty-first Century (3)
- SCAROP: Radiation Oncology Training in the United States: Report from the Radiation Oncology Resident Training Working Group (4)
- Radiation Research Program Workshops (National Cancer Institute) (5–8)
- American Board of Radiology (ABR): development of the Holman academic track
- ASTRO: junior faculty fellowship program
- Radiologic Society of North America (RSNA): research award program

Organization and procedures

Appendix 1 lists the members of the Steering Committee and subcommittees. These were organized with an emphasis on broad representation. The subcommittee chairs, in consultation with their committee members, prepared preliminary reports that were collated and edited by the Steering Committee, reviewed by the subcommittee chairs, and presented as a draft to the Board. This report represents a consensus to the greatest extent possible; however, a number of areas remain controversial.

It must be emphasized that this document is not a statement of policy. Although it defines a range of activities and expertise that we believe fall within the spectrum of radiation oncology, this does not mean that every radiation

oncologist or practice should or will have the described range. Furthermore, many areas within our scope—such as symptom and pain management, combined modality treatment, and coronary artery radiation therapy (CART)—are shared with colleagues in other medical specialties. This report is intended to stimulate our field to be proactive in seeking opportunities to provide outstanding care to patients.

The charge to the subcommittees was not to stake out territory, but to describe why the participation of radiation oncologists is appropriate and/or essential. In parallel, we sought to define the knowledge base and skills of the radiation oncologist to assume the scope of responsibilities appropriate in the respective areas. Implementation of the recommendations may involve many of the organizations related to radiation oncology: suggestions to SCAROP, the Association of Directors of Radiation Oncology Programs (ADROP), and the ABR regarding the residency curriculum; development of specific areas of interest for the ASTRO School of Radiation Oncology; identifying “mini-sabbaticals” in training institutions prepared to address new areas of technical skills, research expertise, or practice; and the development of novel sources of information/training for residents and practitioners.

The following lists the topic and content assigned to each subcommittee:

Patient Care—the role of radiation oncologists in cancer care, including issues related to general patient management, symptom management, palliative care, and end-of-life management.

Nonmalignant (Benign) Diseases—the role of radiation oncologists in treating nonmalignant diseases.

Combined Modality Management—the role of radiation oncologists in combined modality therapy including radiosensitizers and radioprotectors and the administration of hormonal and cytotoxic agents.

Technology and Practice—the role of the radiation oncologist in understanding and utilizing computer-based radiation therapy equipment, interfaces with diagnostic imaging, information technology, and updated quality assurance requirements.

The SCOPE report includes a broad overview of the current status of the field and issues facing radiation oncology. Subcommittee reports address specific issues and recommendations for consideration by the radiation oncology community, noting the potential to redefine some of the practices identified within our specialty.

BACKGROUND

Historically, radiation oncology had a central role in advancing quality-of-life issues through organ-preserving treatment, which allowed patients to avoid amputation, colostomy, laryngectomy, mastectomy, and cystectomy among others. We co-pioneered the use of combined modality therapy with chemotherapy and radiotherapy. We

continue to be called upon to address the symptoms of cancer when all other therapies, including analgesic therapy, fail. We are involved in issues of radiation safety and direct educational and research activities for other health care professionals and the public. We are involved in basic science research, technology development and assessment, cooperative group clinical trials research, education and training, quality-of-life and outcomes research, and translating laboratory findings into the clinic.

The legacy of radiation oncology

From the beginning of the use of therapeutic irradiation, radiation oncologists have been clinically well versed in physical findings and in the patterns of disease progression. The foundation of the treatment we currently apply was formulated on the basis of this clinical acumen.

Because radiation oncology was the first medical specialty that exclusively treated cancer, radiation oncologists assumed total cancer care of the patient. Radiation oncologists in Canada, Europe, and elsewhere continue to assume this role. However, this pattern of practice was not fully established in the United States. Instead, general internists established separate specialties within internal medicine to treat leukemia and hematologic disorders, and for the administration of systemic therapies such as immunotherapy, hormonal therapies, and biologic agents. Medical oncologists and, less often, surgical/surgical subspecialty oncologists assumed much of the responsibility for coordinating primary care for cancer patients.

Early limitations of technology in treatment planning, imaging, and treatment delivery resulted in excessive acute and late treatment-related toxicity. The efficacy and safety of radiation therapy has greatly benefited from a strong emphasis on the development of megavoltage photon therapy, electron beam capabilities, afterloading brachytherapy techniques, and computed tomography (CT)-based treatment planning that now allows for conformal treatment configurations and intensity-modulated therapy. These developments improved therapeutic outcomes and significantly reduced toxicity.

The current practice of radiation oncology

The radiation oncologist:

- is a physician with extensive specialty training and experience in the acute and chronic biologic effects of radiation on both benign and malignant tissues.
- is conversant with the physical and biologic mechanisms of radiation and their modulation by physical, pharmacologic, and biologic agents.
- is expert in the prescription of irradiation with respect to timing, fractionation, dose distribution, and technique of administration, as well as the coordination of radiation treatment with other modalities.
- is knowledgeable about all aspects of the care of patients with cancer and is integral to coordinating care with

generalists and specialists from other oncologic disciplines.

- is versed in the recognition and treatment of acute and chronic morbidity associated with radiation treatment and actively participates in the follow-up of treated patients, including surveillance for cancer- and therapy-related problems.
- possesses the knowledge to critically evaluate emerging technologies for both safety and efficacy and to integrate useful advances into clinical practice with programs that incorporate quality assurance.
- shares a vocabulary and knowledge base with radiation physicists, radiation dosimetrists, radiation therapy technologists, and radiation oncology nurses, with whom we are responsible for precision and safety in radiation delivery and for radiation protection for members of the health care team and the public.

Over the past decade, much emphasis has been placed on refinement of multimodality treatment strategies to maximize response and minimize treatment-related morbidity. Among these are the further development and refinement of sequential or concurrent chemotherapy and radiation, CT-based conformal treatment planning and delivery, and the use of radiation sensitizers and protectors. The role of brachytherapy is being redefined, especially for prostate cancer. There is an evolving appreciation for quality-of-life issues and palliative care.

The future practice of radiation oncology

Radiation oncology has made significant advances that better localize therapy and reduce treatment-related effects. Technical advances have included CT simulation, three-dimensional conformal radiation therapy, intensity-modulated radiation therapy (IMRT), stereotactic radiosurgery, and refinement of brachytherapy techniques. The future looks bright for continued technological improvements, innovative multimodality therapies, and the application of molecular markers and new agents in therapeutic strategies. However, radiation oncology must increase its effort in integrated patient care. While innovative technological efforts must be continued, to sustain our specialty in a competitive and evolving health care system, the SCOPE committee believes we must be recognized for our clinical and biologic as well as technical contributions to cancer care.

PATIENT CARE SUBCOMMITTEE REPORT

Introduction

As highlighted in the Background section, we must identify opportunities to define and appropriately expand our clinical base and recapture what the leaders of our field fought so hard to obtain for us: recognition that we are more than experts in the technical delivery of radiation, but are physicians to cancer patients. It is recognized that the expansion of clinical efforts and expertise will require changes

in residency training and in radiation oncology practice. These changes need not occur radically; however, the radiation oncology community should decide whether to embrace them as enthusiastically as we incorporate new technologies into our armamentarium.

Issues

Four specific areas were identified to expand clinical involvement and improve patient care. These represent examples that address specific issues in radiation oncology; additional possibilities to expand clinical involvement exist.

Issue 1. The administration of systemic agents designed to enhance radiation if given during a course of radiation therapy.

This is discussed in detail in the Combined Modality section.

Issue 2. The expansion of clinical involvement, specifically inpatient responsibilities.

An essential component of our separation from the field of general radiology was our involvement in direct patient care, including admitting privileges to our hospitals. Our role in inpatient care has waned over the last few decades. To recapture our role as cancer experts, radiation oncologists will need to be actively involved in the overall oncologic care, including collaborative management with other oncologic colleagues.

A radiation oncologist may choose to develop specialized skills, or a career path, including medical management and enabling him or her to serve such a role in the practice setting. This inpatient skill is analogous to special expertise in other aspects of radiation oncology practice, such as pediatrics, hyperthermia, radiation sensitizer/protector development, and brachytherapy. It is understood that some radiation oncologists currently in practice would not feel confident managing inpatient problems. However, residency training should include more inpatient responsibility, and newly trained radiation oncologists should be skilled in the inpatient and outpatient management of routine oncologic problems.

Similarly, we must recognize that although all radiation oncologists should be expected to complete simpler brachytherapy procedures, more complicated brachytherapy may require a cadre of radiation oncologists who by virtue of their training, experience, and case volume are comfortable doing such procedures.

Issue 3. Expanded involvement in palliative care.

Because 40% of our patients are referred for palliative irradiation, radiation oncologists should be highly skilled in symptom management. Important in assuming broader clinical responsibilities is awareness of end-of-life issues, providing care and coordinating multidisciplinary support systems for patients and their families.

Issue 4. Application of irradiation in diseases other than cancer.

This is discussed in detail in the Nonmalignant Diseases section

Recommendations

Recommendation 1. Ensure that residents are trained in the theoretical and practical aspects of administration of systemic anticancer agents given in conjunction with radiation therapy (see Combined Modality section).

Recommendation 2. Expand training to better include palliative care, supportive care, symptom management, and pain management. Ensure that residents are adequately trained in general medicine and are capable of managing common oncology-related inpatient problems.

Recommendation 3. Provide continuing education courses for practicing radiation oncologists for topics covered in the above two recommendations. Radiation oncology practices should make an effort to have appropriate expertise available within their practice.

Recommendation 4. To optimally manage potential long-term complications and/or recurrent disease, the radiation oncologist must be trained and involved in the long-term care of patients. Cancer care is a life-long relationship between a patient and his or her physicians.

COMBINED MODALITY SUBCOMMITTEE REPORT

Introduction

Combined modality therapy has become the standard of care for many common malignancies. The definition of combined modality therapy has included sequential or concurrent combinations of surgery, irradiation, and cytotoxic chemotherapy. Combined modality approaches typically seek to optimize aggressive local and systemic therapies to improve overall disease control and vital organ preservation. The standard of care for many adult tumors (e.g., breast, cervix, head and neck, gastrointestinal cancers) and most pediatric cancers includes coordinated use of two or three therapeutic modalities. Planned combined therapy has improved survival in Hodgkin's disease and the malignant lymphomas, for poor-prognosis adult epithelial cancers (e.g., lung and esophagus cancers), and for most pediatric presentations. Concurrent combinations of radiation therapy and pharmacologic agents include standard cytotoxic agents, radiosensitizers, radioprotectors, and evolving investigations in immunologic and biologic interventions. The rapidly expanding knowledge of cancer and radiation biology has already identified unique molecular targets that may be effective in conjunction with radiation therapy.

Combined modality therapy—with traditional chemotherapeutic agents as well as many new molecular therapeutics and biologic agents—will become increasingly common in the management of most tumors. What are the optimal combinations of radiation therapy with the traditional cytotoxic agents? How do we incorporate new agents into therapeutic strategies? How do we utilize potential radiation protectors? These issues represent avenues that require continuing, extensive clinical and translational research. Radiation oncologists must be participants and, often, leaders in these research questions, as the use of agents

in conjunction with irradiation may differ substantially from use of pharmacologic agents alone. Physics and technical planning will continue to provide major therapeutic gains for radiation oncology, but cannot be the only focus for achieving enhanced outcomes in the era of molecular medicine.

Issues

Issue 5. Combined modality therapy requires active participation by the radiation oncologist in planning, implementation, follow-up, and documentation.

Combined modality therapy is ideally decided upon and planned in a multidisciplinary clinic setting or with sequential consultations at the beginning of therapy. The opportunity for active tumor board discussion often facilitates this process. It is critical for the radiation oncologist to be an integral part of such endeavors.

The radiation oncologist needs to be knowledgeable about the mechanisms of combined modality therapy. Acute and long-term toxicities may be distinctly different in concomitant vs. adjuvant or neoadjuvant combined chemoradiation; in most instances, combined therapy is associated with enhanced or different toxicities from those encountered in unimodality therapy. Attention to combined toxicity is even more important because newer radiation delivery schemes may themselves modify toxicity. Radiation oncologists should be able to help develop and manage the necessary supportive care during and after treatment.

The radiation oncologist is also in an excellent position to both define and assess treatment-related toxicity, and to develop strategies to help ameliorate or prevent acute and late toxicities. An essential aspect of clinical care and research is documentation and collection of data such that outcomes may be accurately assessed. Standardized scales and forms that are developed and periodically updated for use in cooperative group clinical trials provide excellent source material for patient assessment.

Issue 6. Patients should have access to all appropriate specialists. Multidisciplinary participation for initial evaluation, treatment, and long-term follow-up must be available to all patients.

Issue 7. Radiation oncologists need to have the knowledge and skills appropriate to administering hormonal therapies, radiation sensitizers, and radioprotectors.

The radiation oncologist must be familiar with the pharmacology and clinical use of agents used in combined modality approaches. Preirradiation hormonal or cytotoxic therapy may be initiated by medical, surgical, or radiation oncology specialists for better adherence to the desired schedule, the convenience of patients, and/or for minimizing the cumulative costs. With appropriate multidisciplinary planning and coordination, concurrent chemoradiation may be directed and administered by the radiation oncologist, especially in the setting of radiosensitizing doses of cytotoxic agents and biologic therapies (e.g., interferons). Radiation oncologists see patients regularly during treatment,

providing a unique opportunity to evaluate tumor response and to identify and categorize acute toxicity.

Issue 8. Radiation therapy may offer a unique tool in the use of new biologic, molecular, and immunologic approaches to therapy. Radiation oncologists must develop and maintain familiarity with the concepts behind such novel therapeutics.

The radiation oncologist must be familiar with the biologic mechanisms and potential uses of new agents that may be used in conjunction with radiation therapy. This includes the systemic administration or radioisotopes including the use of isotopes alone or attached to an antibody or other molecule. These may include novel classes of agents (e.g., anti-angiogenic agents, modulators of signal transduction, apoptosis modifiers) and the use of irradiation to enhance immune response for vaccine trials. Irradiation may also be used to stimulate changes in the tumor that make it amenable to molecular therapeutics. Prospective trials will be developed over the next several years and require the attention of our field to their rationale, design, and conduct. Such combinations will further benefit from the enhanced physical delivery of radiation therapy associated with image-guided therapeutic approaches.

Radiation oncology residents should participate in protocol development with their faculty mentors, including aspects of scientific design, protocol management, and result analyses, preferably at both the institutional level and within cooperative groups.

Recommendations

Recommendation 5. The radiation oncologist should play an integrated role in the planning and management of combined modality therapy, which includes the initial assessment of patients and participation on tumor boards.

Recommendation 6. The training of radiation oncologists should include the pharmacology and mechanisms of action of hormonal agents, cytotoxic drugs used as radiation sensitizers, radioprotectors, and biologic agents. Radiation oncologists should be trained in treatment with systemic administration of radioisotopes, including the use of isotopes alone or attached to an antibody or other molecule.

Recommendation 7. Radiation oncologists must be competent in the management of toxicity associated with combined modality therapy, in addition to being expert in the technical delivery of radiation therapy. Radiation oncologists must be skilled in supportive care, including fluid replacement, nutritional support, symptom and pain management.

Recommendation 8. Radiation oncologists should develop and utilize standardized toxicity scales for both acute and late effects of combined therapies.

Recommendation 9. Multidisciplinary care and long-term follow-up are essential for optimal patient care. The radiation oncologist must be involved in long-term care (as in Recommendation 4).

NONMALIGNANT DISEASES SUBCOMMITTEE REPORT

Introduction

Although typically utilized in the management of cancer, there is an expanding role for radiation therapy in what may be referred to as nonmalignant ("benign") diseases. The basis for radiation therapy in "benign" settings relates to its immunosuppressive, anti-inflammatory, or specific vascular effects. Important in assessing the indications for irradiation are the clear documentation of efficacy and an understanding of the potential risks of radiation exposure. It is the responsibility of the radiation oncologist to help assess the risks and benefits in recommending irradiation, ensure appropriate application, monitor for late effects, and document rigorous radiation safety standards in conjunction with our colleagues in radiation physics and radiation safety.

Issues

Issue 9. Wide-field irradiation is an effective immunosuppressive agent that has a role in transplantation.

Total body irradiation remains an important component of conditioning regimens for allogeneic bone marrow transplantation. Total lymphoid irradiation is important for immunosuppression. The degree of immunosuppression associated with wide-field irradiation is most important in the unrelated or partially mismatched donor setting. An increasing number of recent trials have addressed genetic and immunologic diseases (e.g., osteogenesis imperfecta, osteopetrosis, severe systemic sclerosis, multiple sclerosis, and systemic lupus erythematosus), challenging the importance of dose distribution that may allow specific organ shielding. Collaboration with hematologists, neurologists, immunologists, and rheumatologists is required.

There is continuing interest in the selective use of radiation immunosuppression in human-to-human transplantation and a growing body of research concerning the potential role of irradiation in xenotransplantation (e.g., pig-to-human transplantation). Research is ongoing on the selective use of irradiation as a preparative agent before organ transplantation and for the treatment of refractory rejection. A team involving the immunologist and transplant surgeon should work with the radiation oncologist. Radiation oncologists should be skilled in the application of total body and total lymphoid irradiation.

Issue 10. Radiosurgery and stereotactic radiotherapy have been applied in a variety of nonmalignant disease states, allowing precise "radiation lethality" to achieve desired biologic endpoints in critical anatomic areas.

Stereotactic radiosurgery (SRS) is defined as the delivery of a large single fraction of radiation to a small, discrete intracranial target volume. Stereotactic radiotherapy (SRT) uses similar precision with fractionated delivery. SRS and SRT have demonstrated efficacy in the treatment of an array of benign intracranial disease processes, including arteriovenous malformations, cranial nerve schwannoma, and meningioma. More recent experience suggests its use in the

treatment of other conditions, including pituitary adenoma, trigeminal neuralgia, tremor, and some psychiatric disorders. The procedure is approached in a multidisciplinary manner involving the neurosurgeon and neuroradiologist in conjunction with the radiation oncologist and radiation physicist. Radiation oncologists involved in SRS and SRT must be familiar with the indications for treatment, alternative therapies, appropriate imaging studies, and relevant neuroanatomy. Careful long-term evaluation is essential for diseases with such long natural histories.

Issue 11. Coronary artery radiation therapy (CART) is a rapidly evolving technique that appears to be effective in treating in-stent restenosis.

Coronary artery radiation therapy (CART) has become the standard of practice in the management of coronary artery in-stent restenosis based on sound animal data and several single- and multi-institutional randomized trials. Data regarding peripheral vascular disease is emerging; clinical trials evaluating efficacy in femoral/popliteal artery stenosis and AV fistulas are ongoing.

By NRC training requirements and Food and Drug Administration (FDA) mandate, the multidisciplinary team (consisting of an interventional cardiologist, a radiation oncologist, and a medical physicist) must be involved in such treatment; training includes focus on radiation dosimetry and radiation protection, important elements that bring the radiation oncologist to the team. The radiation oncologist is a necessary member of the team for patient safety and for the appropriate expertise in normal tissue effects for the optimal use of radiation therapy. This is a critical role that transcends regulatory requirements.

Issue 12. Irradiation has proven use in the management of several other highly selected clinical entities, including Graves' ophthalmopathy, keloids, pterygia, hemangiomas, and prevention of heterotopic bone formation.

Recommendations

Recommendation 10. There is a role for radiation oncologists in bone marrow and solid organ allotransplantation and xenotransplantation using wide-field irradiation. A fundamental understanding of the immunology of allogeneic transplantation, organ transplant tolerance and rejection, and the normal tissue effects of wide-field irradiation is necessary, along with close interaction with hematologists, immunologists, and transplant surgeons.

Recommendation 11. The accepted indications for stereotactic radiosurgery and stereotactic radiotherapy in the treatment of benign diseases are likely to become more firmly established in the coming years. Due to the natural history of benign intracranial disease, rigorous long-term follow-up is essential to assess efficacy and toxicity. Radiation oncology as a specialty must establish and maintain a leading role in this evolving field, extending our understanding of the pathophysiology of large, single-fraction irradiation and interactive enhancement of neuroimaging as it facilitates and refines radiosurgery.

Recommendation 12. Radiation oncologists and physi-

cists must remain involved in CART and in other uses for peripheral vascular disease that currently await longer-term results of recent trials.

Recommendation 13. It will be important for radiation oncologists to be involved in a prospective manner in determining objectively the cohort of patients that might benefit from irradiation for nonmalignant processes and assure long-term monitoring for potential toxicity.

TECHNOLOGY AND PRACTICE SUBCOMMITTEE REPORT

Introduction

Radiation oncology is achieving important advances in treatment planning, delivery, and treatment verification due to innovations in volumetric imaging, optimized three-dimensional dose calculations and display, computer-controlled treatment-delivery equipment, and online treatment verification. Volume imaging with advanced CT and magnetic resonance imaging, functional imaging (with PET or magnetic resonance scanning), inter- and intrainage registration, and automatic image segmentation tools have enhanced our ability to define target volumes and critical structures with improved accuracy. These new technologies can be found to some degree at every scale of practice from the smallest community clinic to the largest medical center (9–12). Optimal utilization of complex modern technology requires adequate knowledge and technical support. Vendors are developing and introducing new technologies for clinical use at a rapid rate. However, the equipment that satisfies FDA and International Standards Organization (ISO) requirements is not necessarily free of faults or shortcomings.

Issues

Issue 13. It is the responsibility of the clinical practitioner to establish the appropriateness of all radiation applications to ensure patient safety.

Issue 14. Increased complexity of radiation planning and delivery results in the need for expanded quality assurance protocols, directly affecting allocation of personnel working with or under the supervision of the radiation oncologist.

Quality assurance (QA) of treatment delivery systems involves: 1) measurement of performance characteristics for treatment planning and verifications systems, 2) comparison of performance characteristics with existing technology/practice and established specifications, and 3) identification of appropriate, agreed upon tolerance limits, action levels, and procedures to maintain or regain performance (13).

Issue 15. Treatment planning includes patient positioning and immobilization, image acquisition and registration, image segmentation, beam-aperture design, dose calculation, plan optimization, plan evaluation, and plan implementation, any of which can affect the accuracy of treatment.

The radiation oncologist must have complete understanding and knowledge of the treatment-planning process and associated uncertainties to develop protocols for adequate margins around clinical target volumes to determine the

planning target volume. The determination of margins is a function of institutional clinical practice and represents a judgment balancing the risk of complications against the possibility of local failure.

Issue 16. Successful and safe radiation therapy operations require proper training of and close cooperation among several key individuals who play important roles in each step of the radiotherapy process.

Standards for radiation personnel require a relatively sophisticated staff for all aspects of treatment planning and delivery. A current shortage of radiation therapists, dosimetrists, and nurses requires concerted action on the part of radiation oncology to ensure the availability of highly trained professionals.

Recommendations

Recommendation 14. Radiation oncologists should understand the principles, functionality, and limitation of technologic tools, including factors related to cost and benefit tradeoffs.

Recommendation 15. The radiation oncologist should be familiar with the purpose and scope, specific recommendations, benefit, and regulatory requirements associated with QA protocols that are widely accepted in the field. In that capacity, the radiation oncologist plays a key role in advocating and articulating the need for personnel resources, especially physics, dosimetry, and therapist personnel.

Recommendation 16. It is the responsibility of a radiation oncologist to clearly understand the presence of uncertainty in treatment planning and delivery and how those processes may affect dose distribution. The radiation oncology physicist is responsible for determining the accuracy of both nondosimetric and dosimetric parameters of the radiation treatment-planning process (14).

Recommendation 17. Emerging technology requires additional training:

- Radiation oncologist: additional formal training in diagnostic imaging and computer sciences is necessary.
- Physicist: enhanced training in computer sciences should be mandatory (in addition to formal training in medical physics).
- Dosimetrist: sufficient numbers of dosimetrists are needed to meet demand, and their knowledge base must be sufficient for modern radiotherapy departments' needs.
- Radiation therapist: training to deliver sophisticated treatment fields, with knowledge of techniques and rationale for the complexity of immobilization and treatment delivery. Including education regarding the operation and monitoring of the computers that deliver this treatment.

CONCLUSION

The purpose of the SCOPE report is to stimulate dialogue and move the community toward development of an action plan. The SCOPE report cannot mandate any action, nor is the list of potential implementers limited to those men-

tioned. The SCOPE Committee provides the following recommendations, as numbered within the report, with each recommendation including suggestions for the organization and activity that might implement the activity based upon interest, responsibility, and/or resources available. Not all recommendations require specific actions; for example, some will take place in the course of scientific meetings. To ensure a coordinated and timely effort, ASTRO suggests that the various radiotherapy organizations meet informally as necessary to develop, implement, and assess the action plan.

1. Ensure that residents are trained in the theoretical and practical aspects of administration of systemic anticancer agents given in conjunction with radiation therapy.
 - American Board of Radiology (ABR), Residency Review Committee (RRC)
 - Society of Chairmen of Academic Radiation Oncology Programs (SCAROP)
 - Association of Directors of Radiation Oncology Programs (ADROP)
 - ASTRO School of Radiation Oncology
2. Expand training to include palliative care, supportive care, symptom and pain management. Ensure that residents are adequately trained in general medicine and capable of managing common inpatient problems.
 - ASTRO school
 - SCAROP
 - Association of Directors of Radiation Oncology Programs (ADROP)
3. Provide continuing education courses for practicing radiation oncologists for topics covered in the above two recommendations. Radiation oncologists should make an effort to have appropriate expertise within their practice.
 - ASTRO School of Radiation Oncology
 - American Society of Clinical Oncology (ASCO) educational program
 - Oncology Nurses Society (ONS) educational programs
4. Cancer care is a life-long relationship between patient and physicians. To optimally manage potential long-term complications and/or recurrent disease, the radiation oncologist must be involved in the long-term follow-up and care of patients.
 - Expert long-term care must be considered in establishing practice guidelines; multiple organizations are engaged in this.
 - ASTRO/ACR Joint Economic Committee should continue to address appropriate availability and reimbursement of long-term following by the radiation oncologist.
5. The radiation oncologist should play an integrated role in the planning and management of combined modality therapy, which includes the initial assessment of patients and participation on tumor boards.
 - Association of Directors of Radiation Oncology Programs (ADROP)
 - ASCO, Radiation Therapy Oncology Group (RTOG)
6. The training of radiation oncologists should include the pharmacology and mechanisms of action of hormonal agents, cytotoxic drugs used as radiation sensitizers, other radiosensitizing compounds, radioprotectors, and biologic agents.
 - SCAROP
 - ABR, RRC
 - Radiation Research Society (RRS) educational programs
 - American Association for Cancer Research (AACR) educational programs
 - ASCO educational programs
 - RTOG
 - ASTRO School of Radiation Oncology
 - Other specialty meetings
7. Radiation oncologists must be competent in the management of toxicities associated with combined modality therapies, in addition to being expert in the technical delivery of radiation therapy. Radiation oncologists must be skilled in supportive care, including fluid replacement, nutritional support, and pain management.
 - ASTRO School of Radiation Oncology
 - ASCO educational courses
 - RTOG protocols/training
8. Radiation oncologists must develop and utilize standardized toxicity scales for both acute and late effects of combined therapies. Consideration should be given to the establishment of web-based toxicity forms.
 - ASTRO in conjunction with RTOG, the National Cancer Institute's Cancer Therapy Evaluation Program (NCI CTEP), and the European Organization for Research and Treatment of Cancer (EORTC)
9. There is a role for radiation oncologists in bone marrow and solid organ allotransplantation and xenotransplantation using wide-field irradiation. A fundamental understanding of the immunology of allogeneic transplantation, organ transplant tolerance and rejection, and the normal tissue effects of wide-field irradiation is necessary, along with close interaction with hematologists, immunologists, and transplant surgeons.
 - ASTRO School of Radiation Oncology
 - ASCO
 - American Society of Hematology (ASH)
 - Other specialty meetings

10. The accepted indications for stereotactic radiosurgery and stereotactic radiotherapy in the treatment of benign diseases, neoplastic and non-neoplastic, are likely to become more firmly established in the coming years. Due to the natural history of benign intracranial disease, rigorous long-term follow-up is essential to assess efficacy and toxicity. Radiation oncology as a specialty must establish and maintain a leading role in this evolving field, extending our understanding of the pathophysiology of large, single-fraction irradiation and interactive enhancement of neuroimaging as it facilitates and refines radiosurgery.
 - ASTRO Refresher Courses and School of Radiation Oncology
 - ASTRO Joint Economic Committee
 - RTOG working group, using appropriate endpoints
11. Radiation oncologists should maintain a position of interest and responsibility in CART for coronary artery disease and other potential uses for peripheral vascular disease may develop. It is imperative that the field remain involved as we monitor longer-term results of recent trials. The development of integrated team approaches is important to optimizing utilization; issues of radiation dose delivery and safety are paramount for the radiation oncologist and physicist.
 - ASTRO Scientific Meetings
 - American Brachytherapy Society (ABS) scientific meetings
 - Specialty meetings with cardiovascular/vascular specialists
12. It is important for radiation oncologists to be involved in a prospective manner in determining objectively the cohort of patients that might benefit from irradiation for nonmalignant processes; the radiation oncologist should maintain responsibility for monitoring potential late toxicities in conjunction with other medical specialists.
 - ASTRO Scientific Meetings
 - ASCO Educational Sessions
 - Other specialty meetings
13. Radiation oncologists should understand the principles, potential functionality, and incremental advantage in introducing new technologies. The field must also assess the limitations of existent and new technologies, including factors related to cost and benefit tradeoffs.
 - ASTRO Scientific Meetings and School of Radiation Oncology meetings and workshops
 - ASTRO/ACR Joint Economic Committee continue to monitor and provide analysis
 - Joint programs with the American Association of Physicists in Medicine (AAPM)
14. The radiation oncologist should be familiar with the purpose and scope, specific recommendations, benefit, and regulatory requirements associated with QA protocols that are widely accepted in the field. In that capacity, the radiation oncologist plays a key role in advocating and articulating the need for personnel resources, especially physics and dosimetry personnel.
 - AAPM Scientific Meetings and joint sessions with ASTRO
 - ASTRO Scientific Meetings, Refresher Courses
 - ACR
 - ONS
 - NRC
 - FDA
15. It is the responsibility of a radiation oncologist to clearly understand the uncertainties in treatment planning and delivery and implications regarding dose distribution. The radiation physicist is responsible for determining the accuracy of both nondosimetric and dosimetric parameters of the radiation treatment-planning process.
 - AAPM Workshops, Scientific Meetings
 - ASTRO Scientific Meetings
16. Emerging technology (IMRT) requires additional training:
 - Radiation oncologist: additional formal training in diagnostic imaging and computer sciences as necessary.
 - Physicist: enhanced training in computer sciences and image-related networks and programs.
 - Dosimetrist: sufficient numbers of dosimetrists are needed to meet demand; their knowledge base must be sufficient for modern radiotherapy departments' needs.
 - Radiation therapist: training to deliver sophisticated treatment fields with knowledge of techniques and rationale for the complexity of immobilization and treatment delivery. Including education regarding the operation and monitoring of the computers that deliver this treatment.
 - ASTRO Scientific Meeting and support for Web-Based Dosimetry Training; Manpower Committee
 - AAPM Scientific Meeting, Workshops
 - ACR Manpower Committee
 - ADROP
 - ABR
 - RSNA
 - American Association of Medical Dosimetrists (AAMD)
 - ASTRO Nursing Committee
 - ONS
 - ARRT
 - ASRT
17. ASTRO will consider means of implementing report recommendations.

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APPENDIX 1

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