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Original research article

New perspectives in radiation oncology: Young radiation oncologist point of view and challenges

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ABSTRACT

Aim: To assess the role of the young radiation oncologist in the context of important recent advancements in the field of radiation oncology, and to explore new perspectives and competencies of the young radiation oncologist.

Background: Radiation oncology is a field that has rapidly advanced over the last century. It holds a rich tradition of clinical care and evidence-based practice, and more recently has advanced with revolutionary innovations in technology and computer science, as well as pharmacology and molecular biology.

Materials and methods: Several young radiation oncologists from different countries evaluated the current status and future directions of radiation oncology.

Results: For young radiation oncologists, it is important to reflect on the current practice and future directions of the specialty as it relates to the role of the radiation oncologist in the comprehensive management of cancer patients. Radiation oncologists are responsible for the radiation treatment provided to patients and its subsequent impact on patients' quality of life. Young radiation oncologists must proactively master new clinical, biological and technical information, as well as lead radiation oncology teams consisting of physicists, dosimetrists, nurses and technicians.

Conclusions: The role of the young radiation oncologist in the field of oncology should be proactive in developing new competencies. Above all, it is important to remember that we are dealing with the family members and loved ones of many individuals during the most difficult part of their lives.

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1. Background

Radiation therapy has been in use for the treatment of cancer and other diseases for approximately 100 years. As early as 1897, it was concluded that X-rays could be used for therapeutic as well as diagnostic purposes, and in 1912, Marie Curie published the Theory of Radioactivity. The investigation of X-ray radiation for patient therapy moved into clinical practice in the early 1920s.[1] Since the first uses of radiation to treat cancer, important changes and advancements have occurred,[2–5] including: (1) the generation of higher energy radiation beams from linear accelerators; (2) the use of computed tomography (CT), positron emission tomography (PET), magnetic resonance (MR), and other image data sets to create three-dimensional planning models to accurately guide treatment; (3) the development of new radiation techniques, such as intensity modulated radiation therapy (IMRT), image guided radiation therapy (IGRT), robotic radiosurgery and proton therapy; (4) the implementation of new molecular targeted therapies; (5) an increase in the multidisciplinary treatment of cancer; and (6) a greater emphasis on high-quality research and evidence-based care.[6–8]

2. Aim

The focus of the current article is to investigate the role of the young radiation oncologist in the context of these important advancements, and to explore new perspectives and competencies of the young radiation oncologist.

3. Materials and methods

Several young radiation oncologists from different countries evaluated the recent advancements and the current status of the field of radiation oncology, providing new perspectives about the role of the young radiation oncologist. A young radiation oncologist was defined as having ten or fewer years of clinical practice in Radiation Oncology. To provide a broad range of perspectives, the contributions from four young radiation oncologists from four different countries (United States, Chile, France, and Spain) were included in this article. Three of them are members of a national young radiation oncology group (i.e. Spanish young radiation oncology group [SYROG]).[9–11] The four participants agreed to focus on two topics that currently affect the daily work activities: the implantation of novel technology in the radiation oncology departments and the new competencies developed within a multidisciplinary group. All of them contributed to this report with their own thoughts and experiences.

4. Results

4.1. *Technology and radiation therapy*

Interestingly, the media present this subject as a major recent 'breakthrough' in treatment, largely by demonstrating aspects of technology itself.[12] Yet we know that since the discovery of ionizing radiation, the clinical practice of radiation oncology has benefited tremendously from a long string of discoveries and innovations in physics and technology. One of the major problems that is not often highlighted is that high-tech therapy is often associated with a high cost and, therefore, is not always widely available.[13] The young radiation oncologist should have an understanding of the rational use of new technologies based on scientific evidence of its cost-effective contribution to cancer management. In broader terms, the cancer profession and technology industry should take responsibility by not accepting substandard evidence of marginal benefit without regard for cost. More work is needed to demonstrate true value from new technologies and the cost-effectiveness of emerging new treatments.[14]

In addition, major changes in radiation treatment planning have occurred with advances in functional imaging, especially PET and nuclear MR spectroscopy which are of great value in the planning of radiation therapy, allowing us to define with greater precision the target volume. With more sophisticated imaging and understanding of normal tissue and anatomy, the young radiation oncologist will need more detailed understanding of which constraints are essential and which are desired.[15–17]

Regarding treatment delivery, image guidance in radiation treatment is not a novel concept, and remains of major importance today. For many years, radiation field placement was verified using portal films and, more recently, electronic portal images. However, these modes of imaging are limited to visualizing high-contrast matter in 2-dimensional views. This concept has now evolved into IGRT and volumetric soft-tissue imaging at the time of treatment.[17] The cone beam CT, which consists of a kV X-ray tube mounted on a linear accelerator, has the potential to reduce setup errors and, hence, planning tumor volumes. This, in turn, permits potential delivery of hypofractionated regimens to small tumors with greater accuracy. Investigation of adaptive therapy and online planning is also possible as a result of these technological advances.[17,18]

Perhaps the most attractive feature of these advancements in technology is the ability to now approach any complex tumor geometry, regardless of shape, with an enhanced ability to optimize the dose distribution. Much of the excitement surrounding new advances in radiation technology stems from this concept of dose-escalation. Theoretically, increasing radiation dose should lead to improvements in local control. Studies have shown that CT-based planning and IGRT are associated with reduced dose rate to surrounding normal tissues and a subsequent reduction in serious grade 3 or greater acute morbidity.[12] The real question is what proportion of patients will truly benefit from techniques beyond "conventional" treatment. The cost-effectiveness of these sophisticated radiation therapy methods depends on our ability to identify which patients are at higher risk of locoregional relapse and more likely to benefit from dose-escalation. Not only would this improve the cost-effectiveness ratio, but also improve the individual patient's therapeutic gain.[13]

Ideally, the specialist's training period of the young radiation oncologist should include learning about these new techniques in radiation planning and treatment. Residents should have the opportunity to visit other institutions, if their cancer center does not offer this type of technology, in order