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RadOnc Student Scan

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IN THIS ISSUE

Navigating the Radiation Oncology Odyssey: A Guide from Undergrad to Practice

The journey to become a radiation oncologist is a long and winding yet dynamic and rewarding path that accommodates diverse backgrounds and timelines. This exploration seeks to outline and demystify the process, providing insights for those contemplating a future career in medicine and radiation oncology.

The journey begins as an undergraduate with exposure to key scientific disciplines relevant to radiation oncology through premedical coursework in biology, chemistry, physics, and math. Intellectually curious aspiring radiation oncologists may also pursue degrees in the humanities, social sciences, or the arts in addition to scientific training. Some students proceed directly to medical school after their undergraduate career, while others engage in graduate studies, research, or alternate careers before entering medical school.

Medical school begins with 1 to 2 years of coursework before transitioning to the third year, which consists of core medical rotations often including internal medicine, surgery, pediatrics, obstetrics and gynecology, psychiatry, and neurology. Additionally, those interested in radiation oncology often pursue a PhD or dedicated research time during medical school. In the final year, students interested in radiation oncology pursue rotations in clinical radiation oncology in their home department and often at other institutions. Students then apply to, interview for, and match to both a 1-year program in general medicine or surgery and a 4-year advanced program in radiation oncology starting in the second postgraduate year — overall adding up to 5 years of training after medical school.

Most radiation oncology trainees will spend the first year after medical school, the internship, with a preliminary internal medicine or transitional year program. As a preliminary internal medicine intern, trainees will be mostly indistinguishable from other internal medicine interns and will focus on taking care of patients admitted to the hospital for medical problems. Transitional year programs provide similar training but allow for more flexibility to spend time with surgery teams, in the emergency department, and for elective rotations. The internship's primary goal is to begin to shape one's identity as a physician, acquire skills in caring for acutely ill patients, and develop effective communication and teamwork skills.

Radiation oncology residency starts in the second postgraduate year and is an immersive training program in clinical radiation oncology. It consists of 2- to 3-month rotations where residents will gain competency in treating the full spectrum of disease sites in the domain of the radiation oncologist, including genitourinary (prostate, bladder), breast, thoracic (lung, esophagus), gastrointestinal (pancreas, liver, rectal, anal), central nervous system, gynecologic (uterus, cervix, ovarian), head and neck, skin and hematologic (melanoma, lymphoma), pediatrics, and others. Residents work 1-on-1 with faculty in an apprenticeship format. Programs provide trainees with 10 to 12 months of dedicated time for research or other scholarly activity during residency, usually taken during the fourth post-graduate year. Residents aspiring to a career as a physician-scientist can extend their research time to 18-21 months through the Holman Research Pathway. Before the end of residency, trainees sit for 3 separate written board examinations to become board-eligible in medical physics, radiation and cancer biology, and clinical radiation oncology.

A few trainees pursue further formal subspecialized training through a fellowship program; for example, in the hands-on procedural form of radiation therapy called brachytherapy, palliative radiation oncology, or in a specific disease site or type of radiation therapy such as proton therapy. Most radiation oncologists begin clinical practice immediately after residency in a variety of settings, such as private practice, a hospital or health system, or as academic faculty at a university hospital. With exceptions, those in private practice or at a hospital in the community tend to treat a variety of disease sites as general radiation oncologists, and those working at large academic cancer centers tend to develop an expertise in 1 to 2 disease sites. Around 1 year into practice, radiation oncologists become fully board-certified after passing the oral board examination.

Those that make it through this path are met with a career in a challenging, exciting, interdisciplinary, and tight-knit field. Radiation oncology attracts some of medicine's best and brightest who are especially passionate about applying a tincture of science, technology, and compassion every day to make a meaningful difference in the lives of patients with cancer.

Interview With a Radiation Oncologist

Neil E. Dunlap, MD, University of Louisville School of Medicine

Neal E. Dunlap, MD, is professor and chair of the Department of Radiation Oncology at the University of Louisville School of Medicine. He earned his medical degree from the University of Cincinnati College of Medicine, completed his internship at the University of Cincinnati's University Hospital, and his residency at the University of Virginia Medical Center in Charlottesville. His clinical focus is primarily on multidisciplinary approaches in the treatment of lung cancer, esophageal cancer, head and neck cancers, and liver cancers. His research interests include the application of new treatment technologies to lung, liver, and head and neck malignancies to improve outcomes and reduce side effects. He has investigator-initiated trials open for the re-treatment of lung cancers after previous radiation, evaluation of early radiation-induced lung injury with 4-dimensional CT and treating inoperable pancreatic cancer using radiosurgery. He sits on the NRG Oncology Head and Neck Cancer Core Committee and the National Cancer Institute (NCI) steering subgroup for rare head and neck tumors. He is the institutional principal investigator for multiple national cooperative group studies through NRG/RTOG in the treatment of lung and head and neck cancers.

When did you learn about the field of radiation oncology?

I stumbled into a research opportunity in a radiobiology lab during my undergraduate years at Wake Forest University after a cancer fundraising drive. I was interested in cancer research after my mother was diagnosed with breast cancer during my freshman year in college and I knew little about radiation oncology at the time.

What sparked your interest in the radiation oncology field?

My mother's battle with breast cancer was certainly a huge part in my interest. She underwent radiation after her mastectomy and then had hyperthermia treatment at UCSF after a recurrence. I thought the field was much more unique than medical oncology, with access to cool technology to aid in treatment.

What do you believe was the most beneficial clinical rotation(s) to prepare you for your radiation oncology residency?

Honestly, many medical students overthink this question. My mentor encouraged me to be exposed to a broad array of medical specialties, as you will only be a student once. I loved most medical fields and I wanted to understand multiple specialties. Internal medicine probably taught me how to be a doctor first and think how to manage complex problems. Rad onc is so unique that you are never really prepared. There is a steep learning curve that you must accept.

Which didactic medical school course do you feel prepared you for a radiation oncology residency?

Anatomy and pathology are probably the most important to grasp. I use both every day to understand how to approach treatment for a specific patient.

At what point did you decide to pursue a career in radiation oncology?

I decided halfway through my third year. I really was interested in head and neck surgery but decided that my desire to have a family life might be more of a struggle with a surgical specialty.

What advice do you have for medical students interested in radiation oncology?

Have fun and don't stress out too much. Medical school is short; residency is short; and life is short.

How many residency programs did you apply to?

I applied to 15 programs and had 10 interviews. Things were different when I applied in 2005.

Is there a good introductory radiation oncology textbook for medical students?

I know people have opinions on this question, but I really think you should broaden your horizons and not focus too much on rad onc. Read a real book that teaches you about people and the human condition. There's nothing quite like classic fiction including Dickens, Tolstoy, Steinbeck, etc.

Did you have radiation oncology rotations in medical school?

I rotated in my own department but not outside. Again, times are different. As the immediate past PD (program director), I recommend away rotations especially in the virtual interview environment.

How do you see the future of radiation oncology?

The future is constantly changing. The applications of radiation are changing. I think our future is bright but will be different. Our use of stereotactic body radiation therapy (SBRT) and radiosurgical technologies will likely increase and become more important in long-term management of patients. I also think theranostics will become more important.

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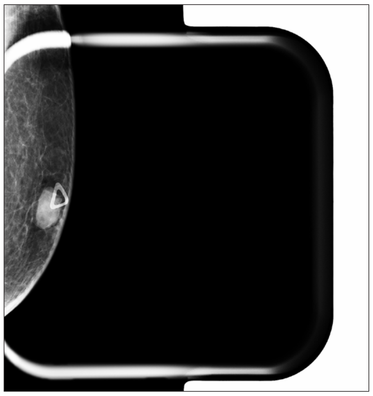
Hot Topics in Radiation Oncology

Interpretable Artificial Intelligence in Radiology and Radiation Oncology[1]

Cui S, Traverso A, Niraula D, et al; *British Journal of Radiology*

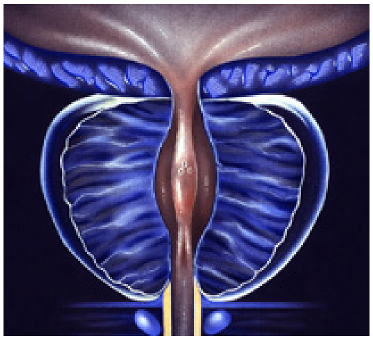
The significance of interpretability in AI systems is explained with elegance in the context of radiation oncology. Three main strategies are summarized in this article: explaining AI model outputs, examining assessment techniques, and providing examples of applicability in different medical fields. The authors emphasize the necessity of exercising caution and stress the importance of having a sophisticated awareness of the inherent limitations of current interpretability techniques.



Proton Therapy in the Treatment of Men with Breast Cancer[2]

Bradley JA, Gracie J, Mailhot Vega RB, et al; *International Journal of Particle Theory*

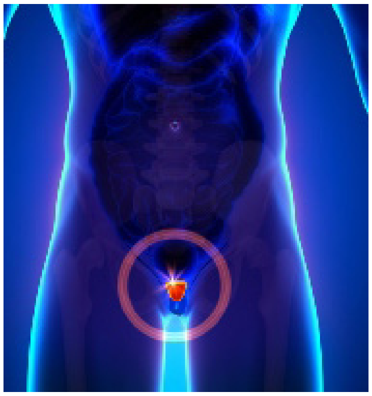
In the landscape of male breast cancer treatment, a comprehensive approach combining various therapies is the norm, with radiation therapy playing a crucial role. Surprisingly, proton therapy remains underutilized in this context. Given that heart disease stands as a prominent cause of mortality in men, and radiation therapy's impact on the heart relates to cardiac issues, there's a growing emphasis on employing radiation techniques that prioritize heart health. In response to this, a descriptive analysis of proton therapy in a cohort of male breast cancer patients is presented, shedding light on its potential in specific demographics.



Intensity-Modulated Radiation Therapy With Stereotactic Body Radiation Therapy Boost for Unfavorable Prostate Cancer: Five-Year Outcomes[3]

Carrasquilla M, Sholklapper T, Pepin AN, et al; *Frontiers in Oncology*

In 2022, prostate cancer was the most common malignancy in the US, affecting 248,500 men. About 20% of new cases are high risk. Radiation therapy, especially dose-escalated approaches, is the primary treatment, with advances such as image-guided radiation therapy (IGRT) and high-dose-rate (HDR) brachytherapy. Stereotactic body radiation therapy (SBRT), a noninvasive option, efficiently delivers high radiation doses. This study explores SBRT as a boost to IGRT for unfavorable risk prostate cancer, aiming to maximize benefits and minimize consequences. Previous reports show promising early outcomes, with minimal impact on long-term quality of life. The study now reports 5-year progression-free survival and prostate-cancer-specific survival in a cohort from Georgetown University Medical Center.



5-Year Outcomes from PACE B: An International Phase III Randomized Controlled Trial Comparing Stereotactic Body Radiotherapy vs. Conventionally Fractionated or Moderately Hypo Fractionated External Beam Radiotherapy for Localized Prostate Cancer[4]

Van As N, Tree A, Patel J, et al; *International Journal of Radiation Oncology*

A recent phase III study involving 874 patients suggests that for people with intermediate risk, localized prostate cancer, a newer way of giving radiation treatment might work just as well in a shorter time. The PACE-B (Prostate Advances in Comparative Evidence) study looked at stereotactic body radiation therapy (SBRT), which gives fewer and higher doses of radiation over 5 sessions instead of lower doses over several weeks. The results showed that SBRT worked as well as the standard radiation for these patients, with a 96% success rate in controlling the disease after 5 years compared with 95% with the usual treatment. Rates of side effects were low for both treatments. This could mean getting the same results in 5 days instead of many weeks.

Primary Endpoint Results of NRG CC003: Phase IIR/III Trial of Prophylactic Cranial Irradiation With or Without Hippocampal Avoidance for Small Cell Lung Cancer[5]

Gondi V, Pugh S, Mehta MP, et al; *International Journal of Radiation Oncology*

The deliberate restriction of radiation dosage to the hippocampus, known as hippocampal avoidance (HA), is well-recognized as an effective strategy to decrease neurocognitive impacts in patients treated with whole-brain radiation therapy for brain metastases. A recent randomized trial involving 392 patients investigated the role and potential benefits of HA in patients not receiving radiation therapy for existing brain metastasis, but undergoing prophylactic cranial irradiation (PCI) to decrease the occurrence of brain metastases in patients with small cell lung cancer (SCLC). Standardized neurocognitive function tests such as the Hopkins Verbal Learning Test-Revised (HVLT-R) were administered to all participants with follow-up assessments conducted as the patients underwent PCI, with or without HA. The results showed that the effectiveness of both treatments was equivalent. The rate of occurrence of intracranial metastasis at 12 months after PCI in both the HA and control groups was not statistically significantly different. The study did not meet its prespecified primary endpoint to show HA's protective effect because the failure rate of the delayed recall portion of the HVLT-R at 6 months was equivalent between treatment groups. However, the addition of HA to PCI demonstrated a statistically significant protective effect against neurocognitive decline. The study suggests that HA during PCI may prevent neurocognitive decline without compromising survival in SCLC patients.

Quantifying In Vivo Proton Damage in Craniospinal Irradiation Using Imaging[6]

Chang C-W, Goette M, Kadom N, et al; *Advances in Radiation Oncology*

Craniospinal irradiation (CSI) is a crucial, curative form of radiation therapy for several pediatric cancers of the central nervous system and involves targeting the entire brain and spinal cord. CSI involves significant toxicity including increased risk for secondary cancer and restricted growth due to off-target dose to the bony spine in young growing patients. Therefore, techniques sparing the vertebrae are beneficial. Proton therapy has additional benefit due to lower exit dose and increased ability to spare the spinal growth plate. Since proton therapy faces the challenge of an uncertain proton range leading to unintended locations receiving dose, researchers in a recent study sought to develop a method quantifying proton damage using MRI. In a small cohort of pediatric patients, the researchers identified bone marrow damage earlier than has previously been achieved based on the degree of radiation-induced replacement of hematopoietic marrow with fatty marrow. The hope is that this quantification can be used to ensure accuracy and precision of treatment margins, enable real-time adjustments during treatment, and ultimately help prevent pediatric patients from experiencing toxicities resulting from this critical treatment.

Interview with a RadOnc Educator and Researcher

Deborah Bruner, RN, PhD, FAAN, Emory University

Deborah Bruner, RN, PhD, FAAN, is the senior vice president of research at Emory University, where she holds two professorships, one as the Robert W. Woodruff Chair of Nursing and the other in the Department of Radiation Oncology. Dr. Bruner has worked with the National Cancer Institute's (NCI's) National Clinical Trials Network for more than three decades and is the only nurse to lead a national clinical trials cooperative group. Dr. Bruner is a multi-PI (principal investigator) of the NRG Oncology group's National Community Oncology Research Program. Her research and leadership focus on patient-reported outcomes, symptom management, and comparative effectiveness of radiation therapy modalities. Dr. Bruner has ranked among the top 5% of NIH-funded researchers worldwide since 2012 and is a passionate mentor for students and junior faculty in nursing, medicine, epidemiology, and psychology.

How did you become interested in oncology?

My first job after nursing school was on a general hospital floor, where I gravitated towards oncology patients. I was intellectually excited by the complexity of caring for patients with cancer, who were often older with multiple chronic conditions, and the treatment modalities converging during their admissions. More importantly, I enjoyed the human side. Caring for patients with cancer is intense and requires a holistic approach. I see it as a personal privilege to care for the dying. It is very rewarding.

How did you come to radiation oncology?

I trained as a clinical nurse specialist (CNS) and worked in gynecological oncology. As a CNS, I performed Pap smears and wrote chemotherapy orders, but many of the patients also received radiation therapy. I worked with Dr. Gerald Hanks, who was in the first class of radiation oncology residents in the US. I learned a great amount from him. Before Dr. Hanks' class in the 1960s, radiation oncology fell under the umbrella of radiology. With the boom of radiation oncologists soon to follow, clinical trials helped narrow in on guidelines to treat many different solid tumors safely and effectively.

When did research become a focus of your career?

Dr. Hanks had long been involved in the NCI Radiation Therapy Oncology Group (RTOG) and invited me to join in 1989. In 1990, the NCI put out the charge that survival and toxicity were not sufficient as the only endpoints. Radiation therapy had proven that it could treat cancer (and treat cancer well!), but we needed other endpoints that assessed quality of life. What are the side effects of radiation therapy, and how are we going to manage them? If we cure someone's laryngeal cancer with radiation but leave them miserable with no salivary glands, how much good did we really provide? I wrote the first trial for the RTOG investigating quality of life outcomes. My study was approved, but it was not the strongest study. I was motivated to learn more. I went to the University of Pennsylvania for my PhD and learned how to be a more rigorous researcher.

Can you speak to the interdisciplinary nature of radiation oncology?

Radiation oncology is inherently a very collaborative field. To treat the immediate issue – cancer – we must collaborate with our medical and surgical oncology colleagues. In studying quality of life related to radiation therapy, it has become evident that we need to rely on non-oncology teams to help manage toxicities. Gynecologists are necessary to manage sexual dysfunction after cervical cancer treatment, neurologists to manage cognitive changes after whole-brain irradiation, and ENTs (ear, nose and throat specialists) and speech therapists to manage swallowing difficulties after treatment of head and neck cancers. Social workers and nursing care coordinators are also extremely important with how demanding radiation therapy logistics can be.

In what direction do you see the field moving in the future?

Improving precision and sparing noncancerous tissue has always been important; it will continue to be the focus of our field. An exciting component of radiation oncology is innovation, as new technologies are always being developed. As new technologies emerge, our responsibility is to prove their worth. Not only do these technologies need to precisely treat cancer and minimize toxicity, they also need to show improved benefit worthy of their cost relative to the current standard of care.

What advice do you have for students interested in radiation oncology?

Game-changing research comes from the NCI's cooperative groups. Radiation oncology falls under the umbrella of the NRG Oncology Group. Attend NRG's meetings, read their studies, and find mentors who are involved in NRG research. Radiation oncology is not a saturated field; there are plenty of opportunities for great studies. Always stay driven by what is best for your patients, not reimbursement.

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Neil E. Dunlap, MD, University of Louisville School of Medicine

Outside of ASTRO, what websites or apps would be useful for medical students in learning more about the field?

I think ACRO (American Society of Radiation Oncology) has great resources for students.

What advice/comments do you have for medical students interested in the field of radiation oncology?

Oncology is about the people we take care of. You have to know how to care for people. The science is important, but at the end of the day those contributions will be forgotten. We will be remembered by the people and families that we touched.

How did you connect with an attending/staff to get your research started?

I was very forward and asked. Most people are too busy to seek you out. This is a time to find something you are interested in and ask for help to design a project.

Who did you connect with to get your research started?

I started with program directors and residents. The residents are the best resource.

What made you pursue the topic of interest that you researched?

The most important thing when picking a project is deciding if you can practically complete it. Many faculty have ideas that are difficult for a medical student to answer in a limited amount of time.

What advice do you have for medical students interested in conducting radiation oncology research (eg, topics of interest, areas of development)?

The experience of research is more important than what you contribute to the literature. Don't spend too much time wasting your hours doing endless projects. Learn from mentors on how to ask questions.

Did you do your research at your medical school or was it done remotely at a separate institution?

I did the research at my home institution.

Did you do research in undergraduate or graduate school prior to medical school?

I did basic science research in college before starting medical school.

Sylvia Choo, BA, is a third-year medical student at the University of South Florida Morsani College of Medicine

ARO INSIGHTS

Virtual Reality and Burnout Prevention: Turning Wellness for Health Care Workers into a Reality

"What if there was a way to combat burnout, a method that allowed you to feel as though you were sequestered from the source of your stress just for a little while?"

Read Ms. Choo's blog post at appliedradiationoncology.com/aro-blog.com.

Opportunities for Career Development

Radiation Oncology Education Collaborative Study Group (ROECSG)

Includes the following:

- Undergraduate medical education (UGME), graduate medical education (GME), continuing medical education (CME), patient education, and interprofessional education groups
- Annual spring symposiums
- Online resources about global health, clinical information, study materials, and more
- Social media and blogs
- OECSG report (visit roecsg.org/roecsg-report for latest issue)

Learn more by visiting roecsg.org.

Radiation Oncology Virtual Education Rotation (ROVER)

A virtual resource for medical students that includes:

- Networking opportunities to meet radiation oncologists from across the country
- Links to join radiation oncology organizations such as the Association of Residents in Radiation Oncology (ARRO) and ACRO
- Educational videos and materials about radiation oncology
- Books, websites, and more

Learn more by visiting radoncvirtual.com.

Find a Mentor

The ASTRO website offers students the opportunity to match with a mentor in radiation oncology who can help witih the following:

- Making career choices
- Understanding what to expect in residency
- Learning more about radiation oncology
- Developing leadership skills
- Balancing work/life goals and more

Learn more by visiting astro.org.

Upcoming Conferences

The Radiation Oncology Summit ACRO 2024
March 13-16, 2024 | Lake Buena Vista, FL

National Proton Conference 2024
April 6-9, 2024 | Boston, MA

World Congress of Brachytherapy 2024
July 10-13, 2024 | National Harbor, MD

ASTRO 2024
September 29-October 2024 | Washington, DC

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