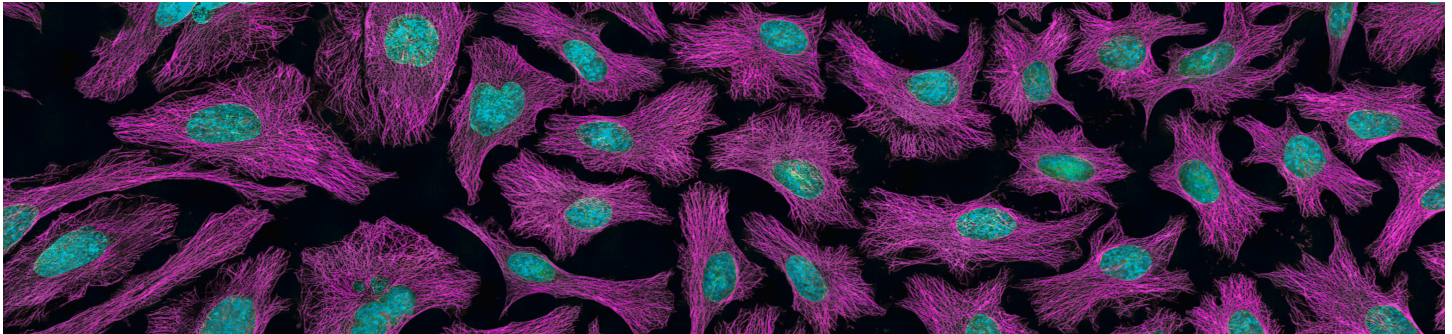


RadOnc Student Scan

October-December 2024

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Ethical Considerations in the Era of Artificial Intelligence



Emerging artificial intelligence (AI) technologies are profoundly transforming the landscape of radiation oncology.¹ These innovations promise more precise and personalized therapy, but they are also introducing complex ethical challenges that demand thoughtful consideration.

Informed consent is not merely a procedural formality but a fundamental ethical obligation. As treatment options become increasingly sophisticated, obtaining informed consent must be approached with heightened diligence.

The complexities of AI-driven tools require health care providers to communicate effectively and ensure that patients fully grasp the potential implications of these tools. Some patients may be hesitant to give consent to an AI-driven computer interface owing to concerns about data transparency and misinformation.² It is crucial to inform patients about the risks associated with sharing information with an AI tool and to empower them to make decisions aligned with their values and preferences.

Integrating AI into radiation oncology also impacts data privacy and security.³ AI systems rely on extensive datasets to refine treatment plans and predict outcomes, raising the stakes for protecting patient information. The ethical responsibility to secure this data is paramount, as breaches or misuse can undermine a patient's trust in health care providers. Effective data protection measures, such as centralized learning, deidentification, or federated learning, are essential to maintaining patient confidence and ensuring compliance with privacy standards.

A third critical ethical issue is the equitable distribution of radiation oncology services.⁴ Although AI offers substantial benefits, its use also risks exacerbating disparities in access to care. High costs and resource demands may restrict AI-driven innovations to select populations, leaving others disadvantaged. Models generated by AI trained with data from a nonrepresentative patient population can lead to bias. Solutions could include expanding clinical trial access for underrepresented populations, ensuring insurance coverage for all standard-of-care treatments, and providing financial incentives and support to help reduce costs. Additionally, increasing access to patient navigation programs could enhance the quality of cancer care.

Navigating the future of radiation oncology requires balancing technological progress and ethical considerations. The transformative potential of AI must be guided by principles that prioritize patient welfare and equity. The American Society of Clinical Oncology (ASCO) has outlined such principles, emphasizing transparency, accountability, and the need for patient-centered approaches to implementing AI in oncology.⁵ Adhering to them can help ensure innovations are deployed responsibly and equitably.

As radiation oncology continues to advance, health care professionals, researchers, and policymakers must stay attuned to the ethical dimensions of these new technologies. By integrating thoughtful, ethical principles with cutting-edge advancements, innovation and compassion can be seamlessly intertwined, benefiting all patients in the future of radiation oncology.

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Interview with a Radiation Oncologist

Interview with a Radiation Oncologist: Neha Vapiwala, MD, FACR, FASTRO, FASCO



Dr. Vapiwala is the Eli J. Glatstein Endowed Professor and vice chair of Education in the Department of Radiation Oncology. Dr. Vapiwala's clinical focus is on treating patients with genitourinary (GU) cancers, serving as the department's first chief of GU oncology. She has led multiple prospective clinical trials and is the national principal investigator of a cooperative group phase III clinical trial treating recurrent prostate cancer.

Dr. Vapiwala is the Eli J. Glatstein Endowed Professor and vice chair of Education in the Department of Radiation Oncology. Dr. Vapiwala's clinical focus is on treating patients with genitourinary (GU) cancers, serving as the department's first chief of GU oncology. She has led multiple prospective clinical trials and is the national principal investigator of a cooperative group phase III clinical trial treating recurrent prostate cancer. Dr. Vapiwala also holds multiple leadership positions on the NCI Prostate Cancer Task Force, the JAMA Oncology editorial board, and the American Board of Radiology GU Exam Committee. She is co-chair of the ECOG-ACRIN GU Early Modality committee, and immediate past chair of the ASTRO Audit and Finance Committee. Dr. Vapiwala is also the newly appointed president-elect of ASTRO and an elected member of the nominating committee of the American Society of Clinical Oncology (ASCO). In addition to her work in oncology, Dr. Vapiwala is an advocate for undergraduate and graduate medical education, currently serving as dean of admissions of the Perelman School of Medicine. She previously served as president of the National Association of Directors of Radiation Oncology Programs and as chair of the National Accreditation Council for Graduate Medical Education's Residency Review Committee for Radiation Oncology.

How did you learn about radiation oncology and when did you decide to pursue it as a career?

Believe it or not, when I started medical school, I had never heard of radiation oncology. I went through all the required clerkship rotations just finding myself incredibly drawn to the cancer patients, even when it wasn't germane to their care at the time. There was no dedicated required oncology rotation, but I was always fascinated by the cancer patients and the underlying biology of their disease.

Medical oncology was what I'd heard of, so I thought, "I'm going to do med onc, and if I fall in love with it, this will be what I pursue." Right at the time I was choosing my electives, three different people, all unconnected to each other, happened to approach me, and all three happened to be going into radiation oncology.

They were enamored with it, and they said, "If you're interested in oncology, you should really check out rad onc. Even if you don't end up going into it, it's important to know." It just sort of opened my eyes to [the] different ways to treat cancer.

I ended up getting that elective right before my med onc rotation, and I haven't looked back since. I fell in love with rad onc, and while I appreciated my time in medical and surgical oncology as a medical student, what I loved about radiation oncology was just the sheer breadth of patients we see at every stage of their diagnosis. We have patients whom we cure, those whom we palliate, and those where it's honestly an unknown, but we collaborate with our colleagues to get the best possible outcome for the patient.

And then [there are] the tremendous opportunities for research, spanning everything from health care delivery and care disparities all the way to hardcore basic science and thinking about the ways in which radiation biology not only drives what we do, but also informs how we can combine radiation therapy with various systemic and local therapies. So I just thought, "Oh my gosh, this specialty is the perfect blend of patient connections," which can be quite intense, [with] science and discovery.

And then finally, [there were] the people. I was so welcomed by the rad onc residents, faculty, and staff. I did not look back.

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

There has never been a better time to be a student interested in oncology and specifically in rad onc. There are so many opportunities for students to learn about our specialty and cancer care in general. A lot of our med student education and mentoring is now also available online and virtually, respectively, through societies like ASTRO and ASCO. Even if your home institution doesn't have an affiliated radiation oncology department, there's a growing list of individuals who are interested in being mentors, even if they're not geographically near you but are perhaps able to host you for away rotations or meet with you at conferences and on calls. Just as with care access gaps for patients, we are trying to fill the gap for students who otherwise lack access to radiation oncology shadowing and research opportunities.

Advice No. 1 is to do a rotation or summer research project in your institution's radiation oncology department. If you don't have one, check out options through the ASTRO website. The Association for Residents in Radiation Oncology (ARRO) is incredibly active in this regard and filled with wonderful trainees who are there to help guide you. There are various trainee scholarships and opportunities to present your work at a meeting and interact with even more folks to learn about the specialty. Whether your intro is through clinical shadowing or research or a combination, step one is absolutely getting yourself out there.

Interview with a Radiation Oncologist *continued*

Another way is to tune in to the virtual webinars hosted by groups such as the American Radium Society (ARS). These enable you to learn from experts in our field who might be reviewing a difficult clinical case or discussing what is it like to practice in a rural or urban area, or about certain research interests or how one gets their career started. Many of these sessions are recorded and are accessible online if you can't attend live.

It's such an exciting time to get to know the field. The number of discoveries at the intersection of rad onc with genomics, radiomics, immunotherapies, and radiopharmaceutical therapy creates excitement around every corner. Students get to come up in this era of all this excitement and science and discovery, so I hope that the readers can avail themselves of some of these opportunities.

What sets a great candidate for radiation oncology residency apart from a good one?

When I see the applicants that come through our door for residency interviews one of the key things we're looking for is that genuine interest in all that our incredible specialty has to offer. Enthusiasm and true interest in patient care and radiation therapy in all of its many forms, from oncologic to benign conditions, can set an applicant apart. These candidates are motivated by the patient, their story, and what brings them to our door, and are excited about utilizing our technology and science to best help them.

All the best grades and exam scores do not guarantee a candidate who loves what they do. Even if they found rad onc late, it is totally okay so long as they have taken the time to learn more about it and have a patient-driven focus. No matter what we develop in terms of awesome tools and toys, at the end of the day we're physicians and oncologists. When we are examining patients, having a strong clinical foundation and communication skills to connect to patients in a meaningful way will get you very far. That energy is what I'm looking for and will come across, even if you haven't known about rad onc forever.

Career Development Opportunities

Radiation Oncology Education Collaborative Study Group (ROECSG)

Focus: Enhancing education in radiation oncology for students, residents, and faculty.

Offerings:

- Comprehensive Educational Programs: Cover undergraduate, graduate, and continuing medical education, as well as patient and interprofessional education.
- Annual Symposia: Regular meetings on advancements and topics in radiation oncology.
- Extensive Online Resources: Information on global health, clinical practices, and study materials.
- Social Media Engagement: Active knowledge sharing and community interaction.
- Publications and Reports: Updated reports are available on their website.

Website: www.roecsg.org

Radiation Oncology Virtual Education Rotation (ROVER)

Focus: Online educational platform for medical students interested in radiation oncology.

Offerings:

- Networking Opportunities: Connect with radiation oncologists across the country.
- Membership Resources: Information on joining professional organizations such as ASTRO and AROA.
- Educational Content: Videos and articles on radiation oncology practices.

Website: www.radoncvirtual.com

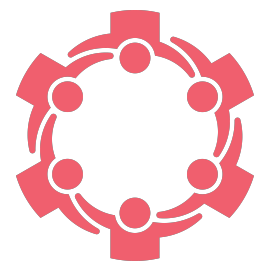
American Radium Society (ROCKET) Program

Focus: Support for early-career professionals and residents in radiation oncology.

Offerings:

- Webinars: Topics include residency applications, away rotations, and oncology career pathways.
- Legal Guidance: Insights into legal considerations in oncology practice and job applications.

Website: www.americanradiumsociety.org/rocket



Interview with a Radiation Oncologist

Interview with a Radiation Oncologist: Kelsey Corrigan, MD, MPH



Dr. Corrigan, originally from Milwaukee, Wisconsin, completed her undergraduate education at the University of Wisconsin-Madison. She earned her MD at Duke University in Durham, North Carolina, and her Master of Public Health (MPH) degree from the University of North Carolina-Chapel Hill. After medical school, she completed her transitional year internship at Memorial Sloan Kettering Cancer Center in New York City.

Dr. Corrigan recently graduated from her radiation oncology residency at MD Anderson Cancer Center in Houston, Texas, and is set to join Radiation Oncology Associates in Milwaukee. She is looking forward to staying involved in education projects, fostering mentorship connections with medical students, and continuing to advocate for improvements in radiation oncology.

When did you first learn about radiation oncology?

My introduction to radiation oncology came during my undergraduate years at the University of Wisconsin-Madison. Driven by my interest to learn more about the field of oncology, I sought opportunities to work in an oncology lab. After applying to several labs at the university hospital, I was fortunate to be hired by a principal investigator who was a radiation oncologist.

What sparked your interest in radiation oncology?

My greatest inspiration comes from the patients. It is an utmost privilege to treat cancer patients and support them through such a challenging period in their lives. Their resilience is remarkable, and I find it incredibly fulfilling to assist them. Additionally, I love incorporating different imaging studies, anatomy, and individualized patient concerns into a cohesive plan to either cure or palliate their condition.

Which clinical rotations were most beneficial in preparing you for a radiation oncology residency?

I think that all rotations are beneficial because radiation oncologists treat patients of all ages, treat different areas of the body, and treat patients who are admitted to the hospital, who have just come from a surgery, who are dealing with other medical conditions, etc. One clinical rotation that I did that was particularly helpful (but is not usually mandatory in medical school curricula) was radiology, because we look at different imaging studies all day as radiation oncologists.

What is your advice for students whose medical school doesn't offer a radiation oncology rotation?

If your school does not provide a radiation oncology rotation, then I highly recommend applying for an away rotation to be able to observe the day-to-day workflow and better understand the field. There are virtual away rotations, too.

Which didactic medical school courses best prepared you for residency?

Anatomy! It was my toughest subject but also the best in preparing me to be able to understand the different structures in all areas of the body.

Is there an introductory radiation oncology textbook or other resource you would recommend for medical students?

Yes, as recommended to me by my mentor in medical school, I highly recommend "Essentials of Clinical Radiation Oncology" by Matthew Ward. The book is straightforward and easy to read as a medical student and goes through many common questions that students may have for each disease site! My advice is to read each disease site chapter as you rotate through that disease site while on a Radiation Oncology rotation.

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

The goal of pursuing research during medical school is to demonstrate your understanding of research and its application to medicine, as well as your ability to complete a project from start to finish. My advice is to engage in topics and types of research that genuinely interest you, under the guidance of a supportive mentor. Success comes from following your passions, rather than forcing yourself into a project that doesn't fully engage you. Medical students can explore various types of research, such as retrospective chart reviews, systematic reviews, clinical trials, quality improvement studies, policy development, and education studies. Choose the type of research that excites you, and then find a topic within radiation oncology, the broader field of oncology, or another medical specialty that sparks your curiosity.

Did you have Radiation Oncology rotations in medical school?

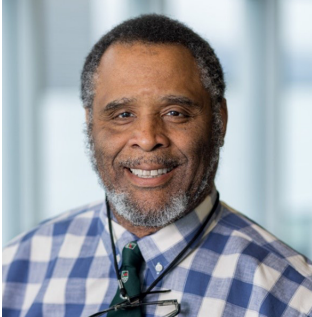
Yes, I had an elective Radiation Oncology rotation in medical school. If your school does not provide a Radiation Oncology rotation, then I highly recommend applying for an away rotation to be able to observe the day-to-day workflow and better understand the field. There are virtual away rotations too!

What inspires you in your work as a radiation oncologist?

My greatest inspiration comes from the patients. It is an utmost privilege to treat cancer patients and support them through such a challenging period in their lives. Their resilience is remarkable, and I find it incredibly fulfilling to assist them. Additionally, I love incorporating different imaging studies, anatomy, and individualized patient concerns into a cohesive plan to either cure or palliate their condition.

Interview with a Radiation Oncologist

Interview with a Radiation Oncologist: Charles Thomas, MD



Dr. Thomas is a professor and the chair of the Department of Radiation Oncology and Applied Sciences at the Dartmouth Cancer Center. Dr Thomas initially trained in internal medicine and medical oncology, working primarily with patients who had gastrointestinal, thoracic, and upper aerodigestive tract cancers.

While working as a medical oncology attending physician, he became interested in exploring multimodal treatments and retrained with an additional residency in radiation oncology. Dr. Thomas has designed and led multiple clinical trials, with a broad range of focuses throughout his career, such as working on gastrointestinal, thoracic, head and neck, and metastatic diseases at different points. Dr. Thomas has been engaged in the National Cancer Trials Network’s (NCTN) Southwest Oncology Group (SWOG), American College of Surgeons Oncology Group (ACOSOG), and NRG Oncology, named after its three constituent groups including the National Surgical Adjuvant Breast and Bowel Project (NSABP), Radiation Therapy Oncology Group (RTOG), and Gynecologic Oncology Group (GOG). These organizations are all part of a national cooperative network running large clinical trials. Currently, he teaches courses on clinical trial design with the Radiological Society of North America Clinical Trials Methodology Workshop. He also is a founding deputy editor of JAMA Oncology.

How did you become interested in oncology?

I completed residency in internal medicine at Baylor. My last rotation of intern year was inpatient oncology, and I enjoyed it very much. It was a special opportunity treating patients who were concerned with their mortality, and the involvement of multiple organ systems met my interests as an internist.

What are some of the strengths of radiation oncology as a field?

It is important for students to know that radiation oncologists have the opportunity to treat patients of all ages, all organ systems, and of any gender. About two-thirds of patients with cancer are treated by radiotherapy at some point, and you have the opportunity to work with complications of all cancer types. This is a very interdisciplinary field where you will work with different specialists. Radiation oncologists, by definition, understand anatomy and staging very well.

What does the balance of clinical care, research, and administrative work look like?

One needs to know their “true north” during a career. You should look for reasons to say “yes” instead of “no,” and give your coworkers the benefit of the doubt. Balancing can be a challenge, but I’ve never been burnt out. Working with patients is rewarding and there are many interesting questions for us to pursue.

Leadership and mentorship have been a big part of your career. How did your interest in shaping the future of the field develop?

*My father was a mentor as an educator. I’ve never thought of mentorship as a burden, I’ve always wanted to help others grow. The goal of a mentor should be that the trajectory of their mentee should accelerate and exceed that of themselves. This field being smaller provides a great opportunity for mentorship. In 2021, I co-edited a book, *Career Development in Academic Radiation Oncology* [<https://link.springer.com/book/10.1007/978-3-030-71855-8>], with Neha Vapiwala, MD, (ASTRO president elect), Ravi Chandra, MD, and several colleagues within the academic radiation oncology community which explores this topic.*

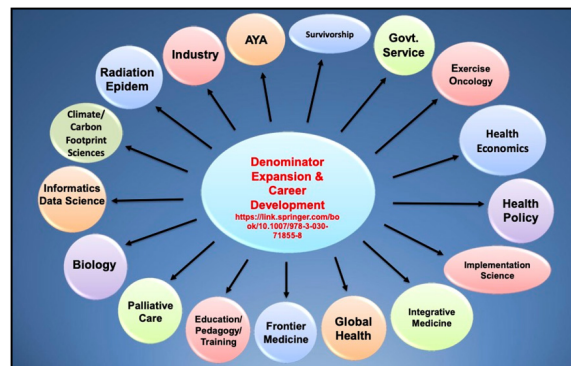


Figure 1. Overview of career expansion opportunities within radiation oncology.⁶

What advice do you have regarding the longevity of a career?

It’s important to recognize that what you can control and what is important to you do not always overlap. Discipline is important in time management and being able to shift priorities. It’s also important to be patient in recognizing that you may have a good idea, but that the idea may not be adopted initially. Don’t be so focused on seeing the results of a suggestion immediately but appreciate that it’s okay if a good idea is executed by someone else down the road. It is also important to know when to leave leadership.

Interview with Radiation Oncology Residency Applicant *continued*

What is your vision for the future of radiation oncology, and how should radiation oncology students prepare for it?

This is an exciting time for radiation oncology. We can expand to offer more personalized radiation treatment prescriptions. Biology may change, and we need to learn how to utilize real-time feedback through methods such as noninvasive imaging and liquid biopsies to tailor treatments. This is also a good time for radiation oncologists to expand their skill sets. Instead of worrying about there not being enough jobs for radiation oncologists, I think we should consider expanding the denominator. Radiation oncologists are poised to be experts in fields like cancer informatics, environmental health, palliative care, survivorship, education and pedagogy, and expanding access to rural patients. Trainees should consider other advanced training to expand their toolboxes beyond the core competencies.

Industry Insights: Current and Future Salary Trends and Job Outlook in Radiation Oncology

In 2024, the salaries of radiation oncologists showed significant variation depending on the source of data. PayScale calculated the national average annual salary to be \$359,957 compared to \$470,260 calculated by Salary.com.⁷ Interestingly, the highest salaries for radiation oncologists are found in Alaska, where the average is \$401,826, and Oregon, with an average of \$401,557. Conversely, the lowest average salaries are reported in Arkansas (\$299,275) and Georgia (\$283,629). Additionally, rural areas experiencing a shortage of radiation oncologists may provide loan forgiveness programs as an incentive. It's also worth noting that a gender wage gap exists, with female radiation oncologists earning, on average, 9% less than their male counterparts, which places the specialty in third place for lowest gender wage gap compared with other specialties.

The job outlook for radiation oncologists is expected to remain stable over the next decade, with a projected balance between supply and demand through 2030.⁸ A recent analysis by Health Management Associates, commissioned by ASTRO, indicates that while the aging population will drive an increase in Medicare beneficiaries and, consequently, demand for radiation therapy, the productivity of existing radiation oncologists is also expected to rise. This equilibrium is vital for ensuring adequate care, though fluctuations may occur with evolving trends. The report highlights the need for ongoing monitoring of workforce dynamics, especially as the growth of Medicare beneficiaries is anticipated to slow beyond 2030, which could affect future supply and demand scenarios. Stakeholders are encouraged to cautiously consider expanding training positions while regularly assessing workforce needs to avoid potential over- or undersupply in the specialty.

Upcoming Conferences

- Particle Therapy Cooperative Group – North America (PTCOG-NA)
 - Date: November 14-16, 2024
 - Location: New York City, New York
 - Website: www.ptcog-na.org/ptcog-na-10th-annual-meeting
- ESMO Asia Congress 2024
 - Date: December 14-16, 2024
 - Location: Singapore
 - Website: www.esmo.org/meeting-calendar/esmo-asia-congress-2024
- National Association for Proton Therapy Annual Meeting
 - Date: April 26-28, 2025
 - Location: Philadelphia, Pennsylvania
 - Website: www.cvent.com/event/F31C3876-A4FA-470A-889D-9B628251F464/summary
- ESTRO 2025 – European Society for Radiotherapy and Oncology
 - Date: May 2-6, 2025
 - Location: Vienna, Austria
 - Website: www.estro.org/Congresses/ESTRO-2025

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Hot Topics in Radiation Oncology



Impact of Short-Course Palliative Radiation Therapy on Pancreatic Cancer-Related Pain: Prospective Phase 2 Nonrandomized PAINPANC Trial.⁹

Tello Valverde, C Paola, et al. *International Journal Radiation Oncology, Biology & Physics*.

This article evaluated a short course of palliative radiation therapy in patients with pancreatic cancer. The study evaluated pancreatic cancer patients with moderate to severe pain refractory to medication. All patients had pain levels between 5 and 10. Radiation was delivered once a week for three weeks at a dose of 8 Gy per fraction, for a total dose of 24 Gy. There was statistically significant reduction in pain (5.9 to 3.8 $P = 0.011$) as well as improvement in quality of life (50 to 60, $P = 0.001$). Grade 3 toxicity was seen in only 10% of patients. No grade 4 or 5 toxicity was observed. This appears to be a well-tolerated and effective regimen for pancreatic cancer patients with pain refractory to medication.



Intensity-Modulated Radiation Therapy Alone Versus Intensity-Modulated Radiation Therapy and Brachytherapy for Early-Stage Oropharyngeal Cancers: Results from a Randomized Controlled Trial.¹⁰

Budrukkar A, Murthy V, Kashid S, et al. *International Journal of Radiation Oncology, Biology and Physics*.

This study evaluated patients with T1N0M0-T2N0M0 oropharyngeal squamous cell carcinomas and in a randomized, controlled trial of intensity modulated radiation therapy (IMRT) to 50 Gy followed by either IMRT boost (20 Gy in 10 fx) or brachytherapy boost with a high dose rate (21 Gy in 7 fx). The primary endpoint was the rate of xerostomia after treatment. Xerostomia was significantly improved in the brachytherapy boost group (14% vs 44%, $P = 0.008$) compared to the IMRT boost group. There was no difference in local control between groups. This study strongly argues for the use of high dose rate brachytherapy for boost in oropharyngeal cancer as opposed to IMRT boost.

Mentorship Opportunities

- ASTRO Mentor Match Program: Career guidance and residency insights.
 - Website: www.astro.org
- ARS Mentorship Program: Tailored support for early-career professionals.
 - Website: www.americanradiumsociety.org
- RSNA Mentor Program: Connects students with radiologists and radiation oncologists.
 - Website: www.rsna.org
- Global Health Mentorship Network and LinkedIn: Networking and mentorship opportunities in radiation oncology.
 - Website: <https://www.ghmentorships.org>



Beam On Podcast: Medical Student Far from Home: Applying to Away Rotations (Part 1)



Hosts:

Mimi Lane, MD, a PGY2 radiation oncology resident at the University of California, Los Angeles, California, and hosted by Sylvia Choo, BA, a medical student at the University of South Florida Morsani College of Medicine.

ARO INSIGHTS

BLOGS COVERING TODAY'S ISSUES IN RADIATION ONCOLOGY



Kyra N. McComas, MD
PGY4 resident physician,
Department of Radiation Oncology,
Vanderbilt University Medical
Center.

ARO Blog: The Multifaceted Paradigm of Rectal Cancer

Author:

Kyra N. McComas, MD, a PGY5 chief radiation oncology resident at the Vanderbilt University Medical Center

"In a world where trimodality therapy has been the standard of care for so long, it's remarkable to think that some of these cancers can be cured with a single systemic agent alone."

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