AppliedRadiationOncology™ July–September 2023

RadOnc Student Scan

Editors: Anthony Alanis[1], Bahareh Sharafi[2], and William Tyree[3]

[1]University of Texas Rio Grande Valley School of Medicine, [2]Ross University School of Medicine, [3]LMU-Debusk College of Osteopathic Medicine-Harrogate

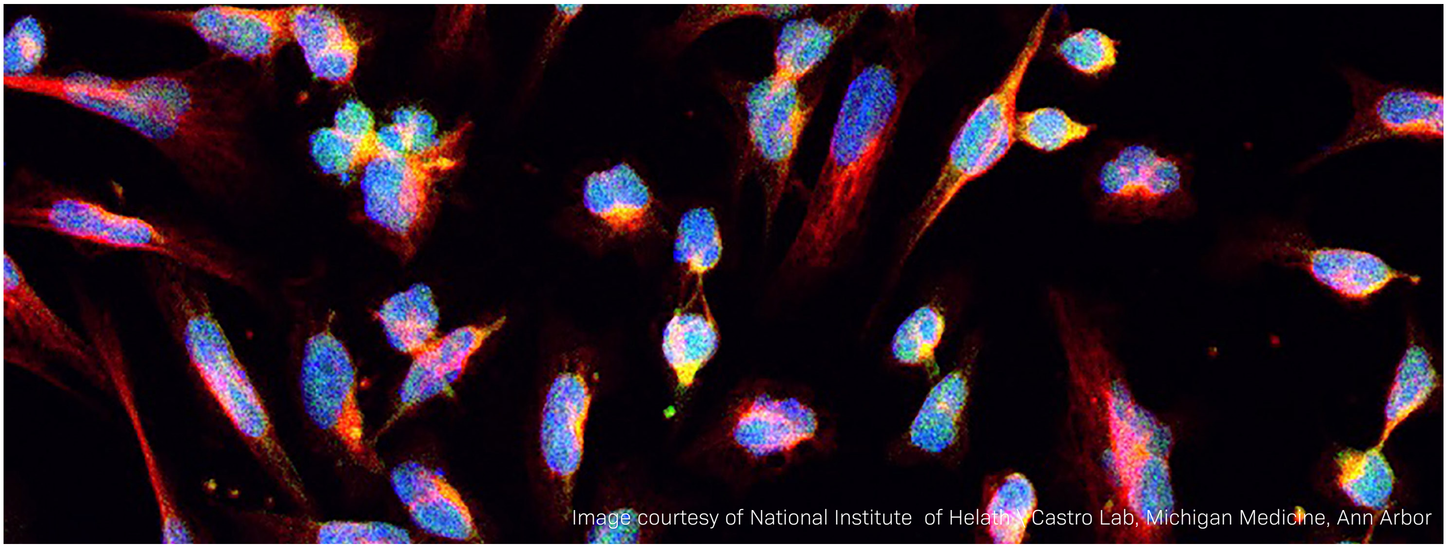


Image courtesy of National Institute of Helath / Castro Lab, Michigan Medicine, Ann Arbor

IN THIS ISSUE

1. Getting to Know More About Radiation Oncology

- Biological Effects of Ionizing Radiation on DNA of Malignant Cells
- Benefits of Proton Therapy
- The Patient Perspective: Expectation vs Reality in Radiation Treatment

2. Interview With a Radiation Oncologist: John Bryant, MD

- What sparked your interest in radiation oncology?
- Did you have radiation oncology rotations in medical school? If not, why do you think that is?
- What advice do you have for medical students interested in doing research in radiation oncology?

3. Hot Topics in Radiation Oncology

- The Landscape of Digital Resources in Radiation Oncology
- Artificial Intelligence-Empowered Radiation Oncology Residency Education
- Clinical Radiation Oncology in 2040: Vision for Future Radiation Oncology from the Clinical Perspective
- Trends in Publication Speed of Radiation Oncology Research from 2010 to 2019

4. ARO Podcast

- *SBRT vs SABR: Does Terminology Differentiate Treatment Intent in Metastatic Cancer?* with Jennifer Matsiu, a 4th-year medical student, and Dr. Kaitlyn Lapen of Memorial Sloan Kettering

5. ARO Blog

- *A Case for Delayed Gratification* by Kyra N. McComas, MD, a PGY4 resident physician

6. Conferences

- SCOS 2023 Annual Conference
- Seattle Cellular Therapy Summit: Patient-Centered Approach to Improve Outcomes
- 2023 Precision Oncology Summit: Personalizing Treatment to Improve Patient Outcomes

Getting to Know More About Radiation Oncology

Biological Effects of Ionizing Radiation on DNA of Malignant Cells

A nonmalignant cell is much more efficient at repairing DNA damage from radiation therapy than a malignant cell. It is this difference in DNA and cellular repair that leads to the therapeutic ratio of radiation therapy. Today, radiation therapy can be delivered with high precision using low levels of irradiation to surrounding tissues, but the therapeutic ratio remains important in minimizing side effects from radiation therapy. Radiation therapy works by using ionizing radiation to induce DNA damage to the cancer cell via DNA double-strand breaks and DNA single-strand breaks. This double-strand break, if not repaired, will result in cellular death of the malignant cell.[1] Van Waarde et al performed studies on the induction of double-stranded breaks in DNA by ionizing radiation. Their findings showed a distinct increase in double-stranded DNA breaks with increasing dose of radiation up to a plateau at 30 Gy.[2] Lim et al evaluated tumor regression in 31 patients undergoing radiation therapy and demonstrated a slow but ultimately dramatic decrease in tumor volume by the end of the course of radiation therapy.[3] The therapeutic ratio of radiation therapy is based inherently in radiation's ability to induce double-stranded DNA breaks in tumor cells. Radiation biology is complex and multifaceted, but double-stranded DNA breaks are a cornerstone of understanding radiation therapy and its effects.

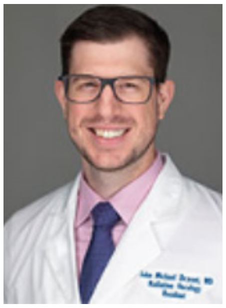
Benefits of Proton Therapy

The greatest conundrum of radiation therapy is how to deliver effective radiation doses to a tumor cell while minimizing radiation exposure to surrounding, healthy regions of interest (ROI). As proton beams pass through tissue, they gradually lose energy. This energy loss is directly related to the square of the velocity, resulting in a dose distribution pattern characterized by a slow increase in dose followed by a sudden spike known as the Bragg peak near the end of the beam's range. Most of the energy is concentrated within a specific depth range just before the particle comes to a stop, known as the unmodulated Bragg peak. By combining multiple intersecting beams, a modulated Bragg peak can be achieved, allowing for the treatment of larger volumes with adequate energy. This approach ensures a moderate dose upon entering the tissue, a consistently high dose within the targeted area, and zero doses beyond the intended target. By precisely focusing proton beams, it is possible to control the depth at which the energy is deposited, thereby maximizing the impact on the desired target.[4]

The Patient Perspective: Expectation vs Reality in Radiation Treatment

Fears and misconceptions about breast radiation therapy (RT) are widespread among patients. However, as highlighted by Shaverdian et al,[5] the actual treatment experiences of patients are generally better than their initial expectations. In fact, most patients agreed that their initial negative impressions and fears about breast RT were unfounded. These patient-centered findings are important for counseling future patients and health care providers about the realities of modern breast RT. Previous studies have documented that women have concerns and fears about breast RT, which can influence their treatment decisions. Despite proven benefits of breast conservation therapy, eligible patients are increasingly opting for mastectomy. The study found that many patients had little knowledge about RT but had heard frightening stories about its side effects. However, among patients treated with breast conservation therapy, only a small percentage found the negative stories to be true, and the majority found their RT experience to be less scary than expected. Similar positive experiences were reported by patients treated with mastectomy. Patients found that the severity of short-term and long-term side effects of RT were generally less than expected. Advances in breast RT have addressed many initial fears expressed by patients, such as organ damage and skin burning, but public perceptions have not kept pace with these advancements. This study suggests that patient perceptions of breast RT have improved due to the significant progress in reducing toxicities and improving convenience. Overall, the study underscores the need to address misinformation and fears surrounding breast RT and emphasizes the positive experiences reported by patients, which should be considered in patient counseling and decision-making.[5]

Interview With a Radiation Oncologist: John Bryant, MD



John Michael "JM" Bryant was born and raised in Miami, Florida. He completed his undergraduate degree in electrical engineering at Florida International University and his medical education at the Herbert Wertheim College of Medicine, both in Miami. Currently, he is a radiation oncology resident at the Moffitt Cancer Center.

Getting Started

When did you learn about the field of radiation oncology?
During a meeting with my advisor at the end of my MS1 year. She was asking me what I was looking for in my career and realized that this would be a field I would be attracted to.

What sparked your interest in radiation oncology?
I have a background in electrical engineering and wanted to find a field in medicine where I could develop long-term relationships with my patients. Rad onc had everything I was looking for in a specialty.

At what point did you decide to pursue a career in radiation oncology?
After my first hour of shadowing a radiation oncologist on my own time during the beginning of MS2.

What do you believe was the most beneficial clinical rotation(s) to prepare you for your radiation oncology residency?
Emergency medicine (you need to be able to recognize when a patient needs additional care or is safe to go home); palliative/supportive care medicine (a lot of clinical time is spent managing toxicity and palliative care); and surgery (you need a deep understanding of anatomy).

How many residency programs did you apply to?
All of them. However, this isn't a typical practice anymore.

Is there a good introductory radiation oncology textbook for medical students?
Not really. Dan Golden's YouTube videos are great as an introduction and radoncreview.org is probably the best resource to reference. It's free and does a great job covering what you would need to know.

Did you have radiation oncology rotations in medical school? If not, why do you think that is?
Only as away rotations during my 4th year. I'm unclear as to why, but likely because it is a small specialty and my school didn't know which rotation to offer as an elective during my MS3 year.

Research in Medical School

How did you connect with an attending/staff to get your research started?
I was connected to my mentor through a dean at my medical school who knew him.

Who did you connect with to get your research started?
I first spent time with him in the radiation oncologist department to gain insight into the field. If they are an academic orientated site, then they'll likely offer projects for you to help with. If not, you could always ask directly.

What made you pursue the topic of interest you researched?
They were one of the first sites with an MR-linac and this new technology piqued my interest.

What advice do you have for medical students interested in doing research in radiation oncology (eg, topics of interest, areas of development)?
My advice would be just to get started with any project that you can as you learn more about the field. When you identify a particular subject that you're interested in, then you can ask your mentor if they are doing any projects related to it or if they know someone who is.

Did you do your research at your medical school or was it done remotely at a separate institution?
The department that I worked in was affiliated with my medical school.

Did you do research in undergraduate or graduate school prior to medical school?
I did research in undergrad. I did not attend any graduate school prior to medical school but likely would've done research during that time as well.

The Road Ahead

What advice do you have for a medical student interested in radiation oncology?
Find a local radiation oncologist who has a history of working with medical students and start finding time to spend in the department. Try to establish a relationship with a radiation oncologist mentor as soon as possible. They will be your best resource to guide you during medical school toward matching in a program that is right for you. Due to how small our field is, finding faculty in your medical school who has good insight into our field can be challenging. If it is available, try to do a rotation sometime during MS3.

How do you see the future of radiation oncology?
I'm biased because of my love for the field, but I think that radiation oncology has a bright future. There are new technologies that are beginning to open new indications for our field.

Hot Topics in Radiation Oncology

The Landscape of Digital Resources in Radiation Oncology

Technical Innovations & Patient Support in Radiation Oncology, Culbert MM, Brisson RJ, Oladeru OT

In recent years, there has been a significant proliferation of online educational resources catering to radiation oncologists and residents.[6] These resources, including discussion boards, wikis, videos, podcasts, journal clubs, online communities, and interactive experiences, play a crucial role in supporting medical education. A comprehensive review was conducted to identify and evaluate digital resources for radiation oncologists, such as educational websites, smartphone applications, web-based multimedia, and podcasts. A total of 47 free digital education resources were identified, offering online tutorials, podcasts, videos, slide sets, applications, and interactive tools. These resources contribute to continuing education for radiation oncology residents, providing valuable support in their professional development. This review serves as a comprehensive compilation of available online education resources for radiation oncologists, offering guidance to clinicians who rely increasingly on digital resources, especially in the context of the COVID-19 pandemic. More details about this study can be found using the corresponding citation.[6]

Artificial Intelligence-Empowered Radiation Oncology Residency Education

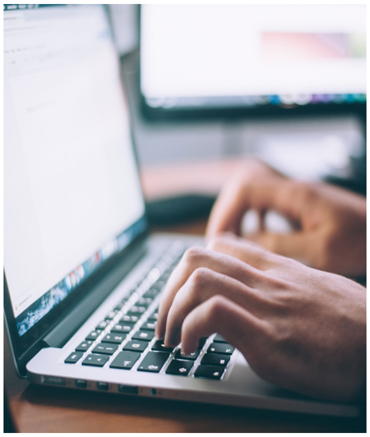
Practical Radiation Oncology, Kwon YS, Dohopolski M, Morgan H, et al

Artificial intelligence (AI) has emerged as a powerful tool that utilizes computer algorithms, often trained on extensive data sets, to simulate human intelligence and enhance task completion, potentially improving efficiency and performance.[7] Its impact has been significant across various fields and is making its way into academic radiation oncology (RO). With ongoing advancements, AI is expected to play a more prominent role in routine clinical practice and clinical education within RO. Therefore, it is crucial for RO trainees to grasp the fundamentals of AI, including its applications and limitations. Efforts are underway to incorporate AI literacy into residency curriculum at both individual institutions and on a larger scale. However, the potential of AI to enhance residency education by supplementing traditional curriculum, particularly in the RO community, has not been extensively explored. This editorial aims to discuss the potential of AI in bolstering RO didactics, clinical encounters, contouring, and special procedures. More content from this editorial can be found using the corresponding citation.[7]

Clinical Radiation Oncology in 2040: Vision for Future Radiation Oncology From the Clinical Perspective

World Science, Vidal GS, Hong JC

Artificial intelligence (AI) and machine learning (ML) have the potential to further advance oncology by enhancing precision and personalized cancer care.[8] This chapter presents a visionary perspective on radiation oncology practice in 2040, highlighting the pivotal role of AI and computational technologies. AI can harness clinical data, improve cancer care delivery, and make it more efficient, affordable, inclusive, and equitable. These advancements will optimize various aspects of cancer care, allowing physicians to prioritize patient needs. The chapter outlines a comprehensive journey through the oncology pathway, focusing on screening, diagnosis, staging, decision-making, treatment planning, delivery, and management. More content from this chapter can be found using the corresponding citation.[8]



Trends in Publication Speed of Radiation Oncology Research From 2010 to 2019

Advances in Radiation Oncology, Rooney MK, Nesbit EG, Holliday EB, et al

The aim of this investigation was to analyze the trends in time to acceptance (TTA) and time to online publication (TTOP) of research articles published in prominent radiation oncology journals from 2010 to 2019.[9] Additionally, the study aimed to identify journal characteristics that may influence TTA and TTOP. The findings revealed a notable increase in the speed of accepting and publishing radiation oncology research over the past decade. It was observed that higher-impact and more selective journals tend to have longer TTA, indicating the presence of comprehensive peer review and intricate editorial decisions. However, these journals demonstrate faster online publication of articles following acceptance. Future research should focus on examining acceptance and publication speed patterns to encourage the prompt dissemination of practice-relevant data. More details about this study can be found using the corresponding citation.[9]

AppliedRadiationOncology™

BEAM ON
PODCAST

EPISODE 3

Does Terminology Differentiate Treatment Intent in Metastic Cancer?

Jennifer Matsiu, a 4th-year medical student at Ohio State, and Memorial Sloan Kettering's **Dr. Kaitlyn Lapen,** discuss confusion and solutions surrounding SBRT vs SABR terminology and its impact on metastatic cancer treatment decisions.

Listen to this podcast and others at appliedradiationoncology.com/aro-podcasts

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

ARO INSIGHTS

A Case for Delayed Gratification

The idea of delayed gratification is a common adage encountered in medicine. Medical students and residents are told time and again to just suck it up, keep going, and don't whine because "this is just the way things are."

Read more about Dr. Kyra N. McComas' blog post at appliedradiationoncology.com/aro-blog.com.

Upcoming Conferences

SCOS 2023 Annual Conference
August 4-5, 2023 | Isle of Palms, South Carolina

Seattle Cellular Therapy Summit: Patient-Centered Approach to Improve Outcomes
August 4-5, 2023 | Seattle

2023 Precision Oncology Summit: Personalizing Treatment to Improve Patient Outcomes
October 7-8, 2023 | San Francisco

References

1. Maier P, Hartmann L, Wenz F, Herskind C. Cellular pathways in response to ionizing radiation and their targetability for tumor radiosensitization. *Int J Mol Sci.* 2016;17(1):102. doi.org/10.3390/ijms17010102

2. Van Waarde MA, Van Assen AJ, Konings AW, Kampinga HH. Feasibility of measuring radiation-induced DNA double strand breaks and their repair by pulsed field gel electrophoresis in freshly isolated cells from the mouse RIF-1 tumor. *Int J Radiat Oncol Biol Phys*. 1996;36(1):125-134. doi.org/10.1016/s0360-3016(96)00212-x

3. Lim G, Bezjak A, Higgins J, et al. Tumor regression and positional changes in non-small cell lung cancer during radical radiotherapy. *J Thorac Oncol.* 2011;6(3):531-536. doi.org/10.1097/jto.0b013e31820b8a52

4. Berman AT, James SS, Rengan R. Proton Beam Therapy for Non-Small Cell Lung Cancer: Current Clinical Evidence and Future Directions. *Cancers (Basel).* 2015;7(3):1178-1190. Published 2015 Jul 2. doi:10.3390/cancers7030831

5. Shaverdian N, Wang X, Hegde JV, et al. The patient's perspective on breast radiotherapy: initial fears and expectations versus reality. *Cancers.* 2018;124:1673-1681. doi.org/10.1002/cncr.31159

6. Culbert MM, Brisson RJ, Oladeru OT. The landscape of digital resources in radiation oncology. *Tech Innov Patient Support Radiat Oncol.* 2022;24:19-24.

7. Kwon YS, Dohopolski M, Morgan H, et al. Artificial intelligence-empowered radiation oncology residency education. *Pract Radiat Oncol.* 2023;13(1):8-10.

8. Vidal GS, Hong JC. Clinical radiation oncology in 2040: vision for future radiation oncology from the clinical perspective. *World Sci*. 2023;3-17.

9. Rooney MK, Nesbit EG, Holliday EB, et al. Trends in publication speed of radiation oncology research from 2010 to 2019. A*dv Radiat Oncol*. 2022;7(2):100863.

Contact: Sharon Breske, managing editor, *Applied Radiation Oncology*, Sharon@appliedradiationoncology.com