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### Pursuing New Horizons With New Collaborators

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# Pursuing New Horizons With New Collaborators: This Is the Future of Radiation Oncology



The field of radiation oncology has always been a dynamic environment that is rich with multidisciplinary collaboration. It is a hallmark of our field. The nature of our work and the focus on the patient has attracted the brightest minds to this field of medicine—no other therapeutic modality draws together so many diverse disciplines. We are long known for our collaboration among biologists, physicists, therapists, and physicians—no single discipline on its own could realize the power of this essential component of effective cancer control. It is teamwork that makes this dream work.

In this volume of *Seminars in Radiation Oncology*, experts from around the world explore the future of radiation oncology from a diversity of perspectives. Collectively, they paint a remarkable and exciting picture of the future. It is a resounding reinforcement of what has always been at the core of the radiation oncology approach—teamwork! The articles are a must-read for everyone in the field—young and old—and for those considering joining in the efforts. It reveals numerous emerging frontiers and these frontiers require us to expand our engagement of new expertise and to challenge traditional roles and paradigms of career development.

Coppes et al.<sup>1</sup> highlight the advances in biological models and rich multimodal datasets are transforming the basic and translational science paradigms. Expanding partnerships in the laboratory setting that bridge into the domains of immunology and genetic engineering are transforming the radiobiology laboratory. Similarly, Deasy<sup>2</sup> beautifully illustrates the explosion of data in the clinical domain is opening new horizons for collaboration with data scientists and leading physicists and modelers to connect and collaborate with the other disciplines that are gradually finding each other in the growing real-world data fabric of our cancer centers. This confluence is attracting computer scientists, mathematicians, and data scientists—the rapid advances in artificial intelligence

technologies is creating an enormous influx of new talent and disruptive perspectives.

In the clinical environment, we are witnessing the maturation of deep skills in innovation and practice change. The pace of technological changes in the past 30 years has created a highly evolved capacity to imagine, consider, and test new devices and approaches to radiation treatment. Lin et al.<sup>3</sup> illustrate the drive toward hypofraction with its thoughtful collaboration striking the balance of technological capability and biological rationalization. This is a byproduct of giving skilled practitioners instruments of greater precision, such as IMRT and IGRT. The resulting impact is far reaching and has progressed with a remarkable degree of safety supported by the clinical research skills of our community and the professionalism of the disciplines that keep the needs of the patient in the foreground. The report by Jia et al.<sup>4</sup> demonstrates this is also very much the case for advances in imaging—as a spatially-localized treatment, radiation oncology depends critically on the accuracy of target and normal tissue delineation. The past 30 years has been a period of constant change that has relied heavily on close collaboration with our colleagues in radiology. Advances in computing and connectivity will only accelerate this collaboration as we move toward a convergent paradigm of quantitative imaging data that is temporally linked and supported through an emerging digital twin paradigm. There is no better illustration of this future than in the adaptive paradigm that is rapidly being realized in radiation oncology clinics around the world. In a manner very similar to the first radiation treatments, it is transforming how we collaborate and teaching us about the underlying factors of autonomy, empowerment, and belonging that set the stage for high performance teams. McNair et al.<sup>5</sup> illustrate this in their report showing how our teams work side-by-side in advancing the patient-centric paradigm using new on-line planning and re-planning tools with either CT or MR-based imaging to maximize the therapeutic ratio one patient at a time.

As we work to adopt these new technologies, the field has maintained its focus on safety and quality. In many ways, fighting fire with fire as we develop and adopt new automated safety and quality assurance technologies to help us manage the new digital capabilities of our treatment machines. Talcott et al.<sup>6</sup> set this context and highlight that artificial intelligence technologies are front and center in this conversation and radiation oncology is benefiting from a decades-long history of managing complex algorithms such as 3D dose calculations. These are skills that are in demand across all of healthcare and we can expect the disciplines of radiation oncology to be pulled into other parts of the hospital and, once again, further expand the circle of collaboration.

Beyond the confines of the treatment room, oncology is becoming increasingly more multidisciplinary. Multi-disciplinary care (MDC) is being transformed as combination therapies that focus on effects such as immune system activation draw together diverse teams. LaVigne et al.<sup>7</sup> illustrate how technological advances are also changing the MDC paradigm—the pandemic had a profound effect on radiation oncology practice through the adoption of virtual care methods and enabling clinical trials coordination and the breakdown clinical research silos in cancer centers. Marion et al.<sup>8</sup> describe how coordination and cooperation is going from concept to reality as disciplines move from their professional alignments to a patient-centered paradigm that arguably has been enabled by shared electronic health records and a focus on the continuum-of-care. In McBride et al.'s<sup>9</sup> pointed article, they argue that the breakthrough of telemedicine adoption will not be easily reversed despite the return of regulatory restrictions in some jurisdictions—patient and providers have experienced the difference and it is clearly here to stay. These agendas may require radiation oncologists to partner with an even broader group of skills to make it happen—such as advocates and legal counsel—but partnering for success is natural for the radiation oncology community. We are also seeing the radiation oncology community engage in other societal agendas including climate change and sustainability. Baniel et al.<sup>10</sup> explore the ‘green horizons in RT’ examining how we can be sure to minimize the environmental impact of radiation therapy. It is exciting to see our community active in this important agenda that affects each and every one of us.

We don't stop there. Boldrini et al.<sup>11</sup> highlight that there is much more to do if we wish to keep our new skills and collaborations into the future. Our educational teams are challenged by this expanding scope of activities and tackling it with new and exciting approaches. Keeping the momentum of change and maintaining the quality of the professionals that make safe and effective radiation oncology possible is not a minor task. Teaching future practitioners and leaders to work in this highly diverse community requires new methods and preparation of our trainees for continuous

learning—this is not a new concept, but it is at a pace that our education teams have never seen before. The rapid developments and hunger for skills in AI and machine learning is a case in point.

Learning is one thing, driving impact is another. Learning to drive impact will be critical for radiotherapy to reach its fullest potential. Radiotherapy is highly cost effective and making that case is an increasingly important part of the innovation agenda. Yashar et al.<sup>12</sup> highlight how our teams are engaging in the economics of health care to help support that pathway to impact. This is an important expansion of our circle of collaboration. We need the message of value in radiotherapy to reach not only ministers of health, but equally ministers of finance.

Last, and possibly most importantly, radiation oncology is rapidly becoming a beacon of globally conscientious oncology expertise. We have been fortunate to have visionaries point out the need and the opportunity to bring the tenacious, collaborative nature of our approach to tackle the larger problem of access to radiation therapy around the world. This last year we lost a true advocate for cancer patients around the world—Dr. Norm Coleman—he challenged all of us to get out of the box and think about the possibilities that new technologies, new paradigms, and new collaborations can bring to those in need of cancer care around the world. Grover et al.<sup>13</sup> assemble a comprehensive and compelling perspective on the global need and they challenge each of us to think about how we can imagine a career in global oncology. They advocate getting out of the box, getting out of our clinics, going to regions of need either in-person or virtually not once or twice, but rather as a career, as an enduring skillset. I hope this challenge will lead many readers to re-think their path to impact and personal fulfilment.

In closing, these are very exciting times. The radiation oncology community is dynamic, talented, and growing. The future will be different and we all have a role in making that different future free from the burden of cancer. We have the culture of teamwork that can and will make this dream work.

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