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Challenges in the transition to independent radiation oncology practice and targeted interventions for improvement

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ABSTRACT

Numerous radiation oncology residents and junior attendings have identified common weaknesses in residency training that hinder the transition from training to independent practice. Recurrent themes include not only general autonomy but also proficiency in technical skills, such as treatment plan review and image verification, and nontechnical skills, such as leadership, mentorship, and education. While multiple strategies to address these deficiencies have been investigated, many are not widely available or may be difficult to implement. We aim to summarize the frequently cited challenges in the transition to independent radiation oncology practice as well as the pertinent interventions that have been explored.

Introduction

The purpose of medical residency training is to provide in-depth, graduate-level medical education to physicians to prepare for independent practice in a specific specialty. However, in recent years, trainees and graduates of various specialties have expressed low confidence in particular skills that are critical for independent practice [1–6]. Often, the issues are due to insufficient hands-on experience and inadequate autonomy during training, prior to inheriting the full responsibility of an attending physician. Within radiation oncology, multiple surveys of recent residency graduates highlight a desire for greater autonomy during residency to better prime the transition to practice [7–9]. Furthermore, these surveys, in addition to editorials [10] and focus groups [11], have identified several key deficiencies within training that are important for practice and merit further development during residency. While these barriers have been acknowledged in various specialties, not only in the United States but also in many countries across the globe, our personal experience is in the U.S. Therefore, our perspective is framed by the structure of our medical system, which differs from many other developed countries. Nonetheless, the experience of a challenging transition to unsupervised clinical practice is a common experience that is applicable to trainees worldwide. The aim of this report is to present these perceived weaknesses in radiation oncology training that hinder a smooth transition to practice and to

summarize select interventions that have been explored in response, with a primary focus on the experience in the United States.

Radiation oncology residency programs are often designed according to the apprenticeship model, and residents rotate between faculty members on a regular basis for exposure to various disease sites and practice patterns. This paradigm allows trainees to closely witness key features of independent practice but is subject to the quality and teaching ability of the assigned faculty member. Furthermore, it does not ensure that the trainee actively participates in or independently performs each pivotal task, especially since the attending physician is ultimately responsible for all medical decisions and associated clinical and nonclinical tasks. In fact, trainee autonomy has been gradually restricted over time in part due to the complexity of radiotherapy treatments and associated workflows, which have not effectively integrated trainee participation. Other reasons for restricting trainee autonomy include concerns for patient safety and the resulting supervision rules, such as those from Medicare billing requirements [12,13]. Yet, there is legitimate concern that waning autonomy during medical residency training may compromise long-term patient safety [14] in addition to physician confidence and competence.

While no clear and simple solution exists to correct these issues, a seemingly ideal solution is the creation of a senior resident rotation, also referred to as a “transition-to-practice program.” However, given the logistical and medicolegal concerns with forming resident-led clinics,

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many residency programs may instead seek focused interventions addressing individual deficits during training. The identified gaps seem to fall into two general categories: (1) tangible skills that are typically performed by attendings, often with limited or no resident involvement in the process (i.e., simulation, plan evaluation, image verification, billing) or (2) intangible qualities that are more difficult to teach (i.e., leadership, communication, collaboration, mentorship, education). First, we will describe educational efforts that intend to individually address specific skills that radiation oncology residents and recent graduates express low confidence in performing but, if mastered, would lead to a better transition to practice. Then, we will discuss efforts within radiation oncology residency programs to organize the aforementioned type of residency rotation that promotes resident autonomy, along with some obstacles to implementation.

Technical skills: plan review, image verification, billing, and coding

The main proficiencies specific to radiation oncology that have been frequently identified as incompletely mastered during residency include technical components of the radiation planning process, such as plan review and on-board or offline image review, and billing [7,8,11,15]. The 4th edition of the European Society for Radiotherapy and Oncology Core Curriculum [16,17] recognizes the tasks involved in treatment planning and delivery as pivotal competencies for trainees to grasp. However, while there is an active effort to create a radiotherapy plan evaluation course [18] that can be integrated into individual program education series, neither national nor international guidelines for how to best teach this skill exist. The recently launched introductory radiation oncology curriculum (IROC) addresses some of these topics [19,20], but the content is limited, as expected in an entry-level course. According to a needs assessment of U.S. radiation oncology residents [15], only 26 % of respondents reported a mandatory treatment planning rotation and 60 % reported insufficient exposure to treatment planning overall. The authors also found that nearly all (92 %) residents surveyed were interested in free web-based treatment planning resources; thus, the authors proposed a web-based curriculum with site-specific planning modules applicable to multiple treatment planning systems. Similarly, a focus group within the department of oncology at Queen's University in Ontario [21] discussed how to align radiation treatment planning education with the competency-based medical education approach, and suggested opportunities for change, including developing a library of cases, offering structured feedback of plan evaluation, and providing audiovisual resources.

While there are few readily available online resources, at least one set of webinars [22] was put together by the American Society for Radiation Oncology (ASTRO) and the Association of Residents in Radiation Oncology in 2018. It features experts in particular disease sites, who demonstrate how they evaluate radiation treatment plans as they work through multiple examples. One notable shortcoming of this series is the lack of resident participation or the ability to practice these necessary skills. Winter et al. [23] describe the creation of a novel learning tool that presents users with radiotherapy plans deemed clinically unacceptable and, through a simulation platform, empower the user to identify the problems before showing them the corrections and the ultimately accepted treatment plan. Unfortunately, this program is still in the early stages with external validation pending, but it represents an exciting development in simulation-based education, which is being increasingly utilized in radiation oncology training [24–29]. A parallel program has been developed for image verification [30,31], another commonly cited weakness among trainees, although it too is not yet widely available. And finally, while billing is a mandatory component of practice, recent graduates report low comfort levels and require the greatest time in practice to gain comfort with billing [7,8]. To our knowledge, there are no published radiation oncology initiatives that address this predicament, although the Centers for Medicare and

Medicaid Services publishes billing and coding guidelines for radiation oncology [32], and ASTRO sells a Coding Resource [33] and holds seminars addressing coding and coverage. Overall, given the limited available resources, the burden is placed on individual residency programs to figure out ways to teach these skills and how much time to dedicate.

Non-technical skills: leadership, communication, collaboration, mentorship, and education

The next category of capabilities that warrant further development during training are somewhat more ambiguous and, as a result, can be more difficult to teach: leadership, communication, collaboration, mentorship, and education. Nonetheless, these are vital elements of a capable physician, as recognized by the CanMEDS [34] Framework published by the Royal College of Physicians and Surgeons of Canada, which outlines the various roles of a physician in order to define fundamental competencies for all areas of medical practice. A global Delphi consensus study [35] was published in 2017 and outlined 20 individual “Leader Role” competencies for radiation oncologists, and several programs have instituted pilot programs to introduce basic leadership concepts to residents [36–38]. Nonetheless, a number of participants have voiced a desire for more interactive methods of learning [38,39]. In response, the European Society for Radiotherapy and Oncology (ESTRO), the Canadian Association of Radiation Oncology, and the Royal Australian and New Zealand College of Radiologists developed an interdisciplinary, interactive online course called the Foundations of Leadership in Radiation Oncology [40], which is targeted to senior trainees and junior faculty, takes place over 4 weeks, and is currently ongoing and available for a registration fee. As with leadership, publications indicate a shortage of mentorship programs within radiation oncology [41], and there are even fewer, if any, programs to prepare residents to becoming an effective mentor [42].

While the individual skillsets listed above may be nebulous, a specific situation in which radiation oncology residents would benefit from more expertise in leadership, collaboration, and communication is the multidisciplinary conference. At least one program hosts a mock tumor board to simulate the experience for residents [43]. No formal evaluation of the sessions was performed, but presumably it is a useful experience, especially for those who struggle with assertion and conflict management. In general, trainees would likely benefit from more experience with interdisciplinary and interprofessional collaboration [44–47], which are extremely important for safe and effective health-care delivery. Proposed interdisciplinary education programs include didactics, workshops, clinical rotations in other oncologic specialties, and a formal shadowing program to observe other disciplines. However, the perceived usefulness of each of these educational modalities is variable and, as a whole, has not been rigorously evaluated.

Lastly, the development of residents as educators, of not only patients but also junior residents and students, has been identified as a weak point in training among U.S. radiation oncology residents [48,49]. In a national survey [48], respondents reported limited formal training in teaching, inadequate feedback, and lack of confidence in teaching, despite ample opportunities and scenarios in which residents are expected to teach. The authors support the creation of a residents-as-teachers curriculum for radiation oncology, as has been implemented in other specialties [50,51]. Although many of the above-mentioned behaviors seem difficult to impart onto trainees, since they are influenced by inherent personal qualities of individuals, they certainly are teachable [52], and it is the responsibility of the graduate medical education programs that expect these competencies among graduates to provide the tools to meet these expectations.

Autonomy through resident-led rotations

A seemingly simple way to address the concrete activities to which

Residents have limited exposure is for training programs to consciously increase resident involvement in the process, but this approach typically relies on personal and institutional motivation. Other avenues include didactics, webinars, workshops, structured rotations (i.e., dosimetry rotation), and additional interactive programs, as described above. However, the most inclusive method to promote resident autonomy would involve an integrated system that safely provides trainees more independence in all aspects of radiation oncology practice prior to graduation.

The most comprehensive resident-led rotations in radiation oncology described in the literature include the chief resident service at Mayo Clinic [53] and the Veterans Affairs Medical Center (VA) rotation within Duke's radiation oncology residency training program [54]. The primary difference between the design of these services is that the rotation at Mayo is for senior residents only, while the VA rotation at Duke is performed by radiation oncology residents of any post-graduate year, with increasing responsibility depending on training level. Both programs arrange for residents to manage a variety of disease sites and assign primary responsibility to the resident for the essential steps in providing care. Relevant tasks include performing an initial patient evaluation, providing treatment recommendations, ensuring appropriate documentation, navigating all aspects of radiotherapy planning and delivery (i.e., simulation, contouring, plan evaluation, image verification), communicating with radiotherapy treatment team members (i.e., nurses, physicists, dosimetrists, radiation therapists) and referring providers, participating in multidisciplinary conferences, managing acute toxicity, and performing follow-up care. This is accomplished through balanced schedules that limit the number of consultations per week and provide ample protected time to perform all necessary tasks, including clinic and radiotherapy planning and delivery, without undue time pressures.

While the resident learns to bear primary responsibility, well-defined supervision policies within each program require residents to review treatment recommendations with a disease-site specific staff radiation oncologist prior to finalizing the treatment with the patient, even though the attending may not see the patient. Attending radiation oncologists also oversee simulation, contouring, plan evaluation, and image verification, including offline review, although their role can be described as a consultant rather than the primary provider. While the impact of these rotations on the competence of radiation oncologists entering practice has not been evaluated, the rotations are well received by participants, as similar ones have been in other specialties [55–57], and address the central issues that make the transition to independent practice difficult.

Both of the aforementioned resident-led services can exist because they operate outside the purview of Medicare. At Mayo Clinic, chief residents on the senior resident associate service, as they call it, can bill independently, since they are not included in the Medicare cost report, along with other training programs of their institution in the outpatient setting. For this to happen, each resident must be independently licensed by the state in which they practice, which can be an expensive, laborious, and time-consuming process. Under the independent state licensure, residents can individually see and bill for clinic visits, yet simulations and treatments are still overseen by the attending because they are in the hospital setting and must follow the teaching-physician rules. Meanwhile, residents at the VA are subject to different supervision policies according to the Veterans Health Directive 1400.01, which grants more autonomy to residents, depending on level of training.

However, it is still possible that other institutions may be able to establish similar programs if they can devise a similar service that functions within the confines of dictating compliance and supervision policies. For example, the radiation oncology department at University of Southern California (USC) features a resident continuity clinic for follow-up visits wherein patients are assigned to the resident who was initially involved in their radiotherapy planning [58]. Each resident is allotted 2 half-day clinics per week for these patient visits, which are staffed by any available attending physician. Although this program is

Table 1

Skills needed in radiation oncology to improve the transition to independent practice.

Identified Deficiencies in Training	Needs Assessments	Targeted Interventions
Autonomy	Nabavizadeh et al.[9] Best et al.[11] Brower et al.[7] Kahn et al.[8]	Resident-led service [53,54]
Treatment planning and delivery	Wu et al.[15]	Continuity clinic for follow-up visits [58] Plan evaluation webinars [22] Case bank of radiation treatment plans [23] Plan evaluation workshop [18] Dosimetry rotation Image verification workshop [31]
Leadership	Turner et al. [39]	Leadership curriculum [36,37] Interactive online tool [38] FLiRO: a comprehensive, international, interdisciplinary blended learning* program [40]
Mentorship	Marsiglio et al. [41]	Mentorship curriculum [42]
Interdisciplinary collaboration and communication	Akthar et al. [45]	Mock tumor board [43] Formal shadowing program Clinical rotations outside of radiation oncology
Teaching	Ni et al.[48]	Resident-as-teacher workshops [65]
Billing and coding	Brower et al.[7] Kahn et al.[8]	ASTRO Coding and Coverage Seminar written resources [22,32,33]

Abbreviations: ASTRO, American Society for Radiation Oncology; FLiRO, Foundations of Leadership in Radiation Oncology.

* Due to the Coronavirus disease 2019 (COVID-19) pandemic, multiple sessions over the last few years have been held fully online. However, typically the course involves both virtual and in-person components.

less extensive than those at Mayo or the Durham VA, participating residents correspondingly expressed satisfaction with the experience and felt a significant sense of autonomy, plus an improved sense of physician-patient relationship, continuity of care, personal well-being, and confidence as a physician. There is evidence that other institutions, such as in Canada [59], are interested in pursuing similar endeavors, and multiple stakeholders have identified this as a desirable solution in order to facilitate the transition to practice [8,11]. Although the exact mechanisms through which each of these programs exists is beyond the scope of this article, similarly structured rotations emphasizing resident autonomy likely represent the optimal approach to address multiple challenges encountered as a new attending physician.

Conclusion

In conclusion, we present the major challenges in transition to practice among new radiation oncology providers and describe studied interventions aimed at addressing these perceived deficiencies in training (Table 1). Although most experiences about the obstacles inherent in the transition to unsupervised practice and subsequent interventions illustrated here are from the United States and Canada, these concerns are likely experienced in most, if not all, other countries with similarly structured training programs, as these difficulties are commonly described across various specialties internationally [60]. It is critical that we confront these issues, as they have been repeatedly identified as obstacles to a timely transition into independent practice. Furthermore, as the fundamental purpose of residency is to produce physicians who are prepared for independent practice, a smooth transition to practice would logically be the ultimate outcome of a successful residency. However, any new educational intervention should be judiciously incorporated into radiation oncology residency training. As we have been cautioned by Golden [61], and originally by Abrahamson

[62], our field is at risk of “Curriculum Hypertrophy” if we continue to add more objectives for resident training without removing ineffective ones. Plus, we cannot expect one-dimensional educational initiatives delivered at single time points to have a long-lasting impact on trainee proficiency and competency. The ideal way to support a resident transition to independent practice involves approaching the transition as a continuous process, during which we should incorporate the most valuable learning opportunities [63]. Although a specialty-specific national curriculum currently in development [64] in the United States will specify and refine expectations for resident development, the onus of providing satisfactory and comprehensive training of radiation oncology residents will continue to be on individual training programs. Therefore, we strongly encourage radiation oncology residency programs to continue learning from their graduates by seeking feedback and to incorporate meaningful changes to their training programs to better equip future radiation oncologists.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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