COMMENTARY

Image Guided Radiation Therapy: Unlocking the Future Through Knowledge Translation

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Essential for the expedient translation of technological and scientific advances into effective clinical practices, education needs to be moved from “nice afterthought” to ‘vital enabler of success’ if the oncology patient is to be assured benefit from the myriad advances surrounding our practice. In the 2012 article for Nature Reviews, “Image-guided radiotherapy: from current concept to future perspectives” (1), Jaffray articulated the technological innovations surrounding image guided radiation therapy (IGRT) and how they will set the stage for dramatic changes care. Research and discovery in these areas are necessary to inform future practice, but discovery alone will not be sufficient to positively impact care. Delays in incorporating these innovations into care (2) or failures in implementation that undermine quality and result in poor outcomes (3, 4) both prevent the value of the discovery from reaching the patient.

How can challenges in implementation be mitigated? Education. We considered here education as the broad term for transfer or acquisition of knowledge to develop and maintain competence in the provision of safe and high-quality clinical care. It can encompass any number of delivery models, pedagogic approaches, and time points in the trajectory from trainee to established clinician. Education is central to the ‘learning health system,’ fostering further discovery and creating a perpetual discovery-education-care continuum, facilitating this translation of knowledge (5). Effective and timely translation requires recognition of the pivotal role of education in the journey from benchtop to clinic, often overlooked in the ‘clinical’ journals most read by practitioners. Using the discovery-education-care continuum, modified from Dzau et al (6), we articulate that the ultimate goal of any advance (IGRT in this case) is most effectively achieved when education is embedded within the innovation and care domains.

To realize the full potential of IGRT discovery, consideration must be given to entry-to-practice competency, continuing education, and interprofessional education. These are not mutually exclusive, but when integrated into a robust education framework, they provide the scaffolding necessary to foster discovery and its effective translation into care.

Given the unprecedented rate of technology innovation, professional training programs are becoming outdated. Competency profiles must be regularly updated to address the evolving landscape of clinical practice.

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One radiation oncology residency program acknowledged that curriculum updates lagged behind clinical IGRT innovation, posing a challenge for radiation oncology trainees. A three-phased effort informed a novel and adaptable competency profile in imaging literacy, accepted for inclusion in specialty training requirements such as those of the Royal College of Physicians and Surgeons of Canada (7, 8). Innovative strategies for addressing this new curricular content for trainees are emerging, and related work is gaining traction in academic spaces, such as with the Canadian Anatomy and Radiology Contouring Boot Camp, the work of the Radiation Oncology Education Collaborative Study Group, the American Board of Radiology’s Self-Assessment Modules, and others (9-11). To ensure clinical integration of IGRT, we must all work together as researchers, clinicians, and educators, establishing mechanisms to ensure that innovation is reflected in precertification curriculum.

Formal strategies for attaining and maintaining clinical competence after licensure are equally important. To integrate emergent technologies into practice, those of us at the clinical ‘front lines’ must be equipped to streamline implementation. Two important factors are embedded here; instilling an appreciation for lifelong learning, and encouraging and facilitating engagement in this learning as part of regular employment. In their call to action for academic health sciences centers, Dzau et al (6) argued the need for lifelong learning skills, acquired through a transformative education model. Most simply, this model suggests that skills relating to critical synthesis, creative adaptation, and integration—and the expectation to make use of these skills—become the cornerstones of education, as opposed to aptitude in current practice alone (12).

To address the integration of technical skill acquisition with accompanying knowledge and judgment in clinical IGRT decision-making, the Accelerated Education Program at the Princess Margaret Cancer Centre (www.aepedducation.ca) envisioned a novel Image-Guided Radiation Therapy Education Course in 2005. Although important for content to represent state-of-the-art practice, the focus was deliberately not on cutting edge research but rather on practical application of innovation drawn from experienced users, including simulation-based, hands-on IGRT image registration exercises. A key objective of the course was to equip participants with skills to become local champions of IGRT education and practice change (13).

Robust local skill development programs are also important at the onset of clinical implementation of new technology. As cone-beam computed tomography was introduced at the Princess Margaret, a structured and proactively implemented two-level training program ensured that radiation therapists were equipped to manage daily IGRT decision-making (14). A mandatory annual refresher course has subsequently been introduced to support growing therapist autonomy in IGRT decisions in many jurisdictions (15). Such programs require coordinated development and oversight but are essential to the standardization of evidence-informed practice. Models such as train-the-trainer and hub-and-spoke centers of excellence are essential. Failure to adequately address the educational gap in these situations is likely to result in unsafe practice and implementation failure. Poor quality care can be delivered with high quality technology.

We believe IGRT practice is also facilitated through coordination of interprofessional efforts. The evolution of specific roles in one discipline does not occur in isolation from others, and the value of a collaborative approach to innovation implementation cannot be underestimated. Engaging in interprofessional education, or “learn[ing] with, from, and about each other” is essential for future effective practice (16). Structured interview research conducted with participants in the Princess Margaret’s IGRT Education Course demonstrated that the increased workload and stress of technology implementation could be mitigated by joint exposure to a common terminology or lexicon, appreciation for others’ knowledge and expertise, and optimization of work distribution and task-shifting (13). The need for individual professional skill and knowledge is not negated, but when relevant, we should engage together in preparing for practice change.

In considering novel concepts of competency, Lingard (17) sums it up well as the need for “deliberate team practice,” focusing less on individual competence and more on team competence, or whether the appropriate constellation of competencies is available and effectively distributed. As innovation is introduced, teams need to re-evaluate what constitutes team competence in delivering high-quality care. The team must collaboratively define roles and responsibilities, together ensuring that we each possess the necessary knowledge, skills, and judgment to deliver safe and effective radiation therapy.

Together, these education strategies contribute to the strengthening of the discovery-education-care continuum. Disruptive technology innovation will drive the need to change practice, requiring distinct interprofessional collaboration, knowledge translation, and task-shifting among professionals. For example, advances in the use of magnetic resonance imaging in radiation planning and treatment will require interprofessional consideration of novel workflow implementation and continuing education needs with regard to magnetic resonance safety and imaging interpretation.

Evidence-based education solutions are needed to prepare professionals for evolving practice. We need to consider the role of implementation science, or the study of methods to promote the integration of research findings into health care practice. This is clearly linked to the discovery-education-care loop. Education must be reimagined not as an isolated activity operating independently from innovation but as the intrinsic element accelerating it from bench to clinic. The recent rise of knowledge translation ‘supplement’ grants is helpful, but better still will be direct incorporation of knowledge translation requirements for research funding. Integration of educators into basic and translational clinician/scientist teams will become the
research paradigm of the future. As Jaffray noted, “this is a perfect storm that has created a well-equipped, thoughtful community with the capacity to maximize the positive impact of [advances in radiation therapy]” (1).

Many factors affect translation of discovery into practice. Education is one aspect, historically not prioritized, that must be afforded the necessary attention and resources to accelerate the discovery—education—care continuum. Moving forward, we need to consider knowledge translation strategies further upstream in the discovery process, avoiding the “just-in-time” approach of designing educational initiatives only when a current and urgent gap in knowledge or skills is identified. Considering knowledge translation at the outset, and disseminating information on relevant programs and models, may help to provide us a framework for accelerating the pace of integration of future innovation in our field. Industry engagement in developing and making available offline simulation versions of clinical software interfaces will provide platforms to facilitate competency building in a safe and responsible manner.

The strengthening of learning health systems will become the foundation of the discovery—education—care model, and provides a mechanism with which to more consistently engage in knowledge translation. Success will be reflected in reduction of lag time of innovation into patient care, coordinated and effective practice change in response to innovation, and more consistently high-quality care globally. A coordinated and systems-level approach to education is necessary to fully and responsibly exploit the potential of IGRT, facilitating and supporting high-quality and personalized care.

References