

# Vital Signs in Radiologic Education: Creativity, Innovation, and Change

Priscilla J. Slanetz, MD, MPH

“Creativity is contagious. Pass it on.”  
—Albert Einstein

Over the past several decades, radiology as a specialty has been transformed in many ways. Human imagination combined with an ability to assimilate new perspectives and ideas has led to substantial technological advances whereby radiologists can now image the entire human body in under a minute, obtain in vivo data on tumor metabolic activity, and perform image-guided therapies for a variety of benign and malignant diseases. The field of radiology has catapulted to the forefront of patient care, with imaging now playing a critical role in not only diagnosis but also treatment of nearly every human ailment. In a recent study of utilization of imaging in the emergency setting, nearly 50% of patients had at least one imaging examination during their visit (1). These changes in radiology practice have brought the radiologist out of the dark room and essentially to the bedside, with the radiologist serving as an engaged and valued member of interprofessional teams.

This innate human curiosity that drives health care and the specialty of radiology forward has also transformed radiological education. Curiosity and passion to train the next generation of radiologists has led educators to be creative, experiment with new teaching approaches, and incorporate ideas from other fields to reach millennial learners. The days of the traditional didactic lecture have essentially vanished, and the interactive case-based and reflective session paired with pre-session assignments has taken hold. In this issue, Chen, a millennial himself, provides readers with insight into the best ways to teach millennials that includes setting specific goals, using technology to demonstrate relevance, providing frequent formative feedback, and promoting self-directed learning (2). As radiological education has evolved with the changing landscape of clinical practice, educators have come to embrace adult learning, discover the flipped classroom, integrate technology into teaching, and create a blended learning

environment. Physics presents a particularly great challenge for most programs, and thankfully, Richardson and Behrang provide readers with an interactive way to teach physics using scientific notebook software (3). Other new challenges facing educators are the adoption of patient portals by many health-care systems (4) and the impending integration of machine learning and artificial intelligence into clinical practice (5).

In addition to learning about how best to teach millennial learners and how to approach the educational challenges associated with advances in care delivery, Omary provides readers with insight concerning the potential role of social media in radiological education, arguing that its benefits far exceed its potential risks (6). Koontz et al. share their own experience with incorporating social media into residency education (7), whereas Hyunsoo et al. provide insight into the impact of online forums on medical students participating in the National Resident Matching Program match (8). In addition, Johnson et al. provide guidance on how best to utilize Instagram as an engaging tool for teaching radiology (9).

Within residency education, there are many opportunities to embrace new approaches to teaching and learning. Shenoy-Bhangle et al. validate the value of nonclinical mini-fellowships during the PGY-5 year of residency training (10), whereas Snyder et al. describe his early experience with a special distinction track for noninterpretative professional development (11). Cogswell et al. present their work which investigated whether having a PhD and whether dedicated research time during residency translates into more research productivity during training (12). Interestingly, Davenport et al. show that regular participation in didactic conferences does not necessarily correlate with clinical knowledge and performance, once again affirming that our learners are diverse and as educators, we must recognize the need to provide learning experiences that are varied (13). Given that many residency programs have 24/7 in-house faculty coverage, there is still a need to assess the impact of discrepant reads between attendings and trainees for on-call cases, a topic of interest to Mellnick et al. (14). Monitoring compliance with all of the Accreditation Council for Graduate Medical Education mandates and ensuring that each trainee has an up-to-date learning portfolio can readily be facilitated using technology, as outlined by Mandell et al. in this issue (15). Finally, given that nearly half of practicing radiologists are at risk for burnout, Smith and Guennette provide insight into the interplay between job resources and demands with personal accomplishment during residency (16).

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From the Department of Radiology, Beth Israel Deaconess Medical Center, 330 Brookline Avenue, Boston, MA 02215 (P.J.S.); Harvard Medical School, 25 Shattuck Street, Boston, MA 02215 (P.J.S.). Received February 26, 2018; revised February 27, 2018; accepted February 27, 2018. **Address correspondence to:** P.J.S. e-mail: [pslanetz@bidmc.harvard.edu](mailto:pslanetz@bidmc.harvard.edu)

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Within the realm of medical student education, educators continue to innovate by increasing preclinical exposure to imaging via interactive case-based sessions (17). Another recent educational challenge has been the newly integrated residency in interventional radiology. In order for these residencies to succeed, we must expose medical students to the field, and the Association of Program Directors in Radiology provides readers with ideas on how to do it successfully (18).

Finally, no education issue should be without resources to aid institutions in recruiting the best and brightest into our field (19,20). Educators also need to enhance their own skills in assessing the educational impact of their teaching. In this issue, Shankar et al. provide readers with a resource to assist in the assessment of educational interventions using a survey-based approach (21). Knowledge of topics outside clinical radiology is also critical for the success of our field. Hence, Kudla et al. provide practicing radiologists and trainees with a comprehensive review of the top tools currently utilized in quality and safety initiatives (22).

This education issue marks the seventh joint effort of the Alliance of Medical Student Educators in Radiology and the Alliance for Clinician Educators in Radiology in capturing the innovative teaching that keeps our field alive and well. Most importantly, however, none of this would be possible without the direction of the new Editor-in-Chief, Reed Dunnick, the multiple dedicated journal reviewers, and the journal's editorial coordinator, Flora Cauley. Without these individuals, we would not be able to pass on all of this creativity to other passionate educators like yourselves.

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