A New Normal in Radiology Resident Education: Lessons Learned from the COVID-19 Pandemic

M. Hunter Lanier, MD, PhD • C. Austin Wheeler, MD • David H. Ballard, MD

The COVID-19 pandemic has been a defining challenge for a generation of physicians and trainees. Radiology education was not exempt from its effects, as the need for social distancing required residents and attendings to read remotely, educational opportunities went virtual, and the decreased volume of elective studies limited exposure. Residency educators responded admirably, rapidly implementing numerous changes to resident education. The rollout of effective vaccines now has residency programs (and society!) hopeful about returning to "normal." However, as we undergo this transition, we should reflect on which changes to keep and which to discard, guided by an understanding of adult learning best practices (1,2). We propose selective retention of virtual spaces and continued expansion of informatics-based learning.

Innovation in the virtual sphere represents the most ubiquitous change to training. Virtual platforms have enabled socially distanced readouts between trainees and attendings, remote site locations, and online resident conferences. While there are limitations, virtual platforms offer many opportunities, including readily available recordings and audience polling. Recorded didactic lectures allow residents to learn at their own pace and convenience. These lectures become increasingly powerful when previewed asynchronously before synchronous conferences in a flipped classroom model, a widely studied and effective strategy for medical education. A recent meta-analysis found that flipped classroom models in radiology medical student education provide an advantage in performance, as evidenced by higher examination scores and improved practical skills, as well as improved course satisfaction (3). Furthermore, interactive technologies such as the polling features readily available on virtual platforms can improve trainee engagement—especially when coupled with scorekeeping and competition. Gamification strategies have been increasingly incorporated into traditional curricula to promote resident buy-in (4). Virtual platforms enable new and creative methods for resident education and warrant continued use.

Virtual platforms have also facilitated new avenues for residents to connect with experts and peers. Residency programs can now invite guest lecturers without the constraints and costs of time and travel. Joint conferences among residency programs are also more common, allowing networking opportunities and exposure to different approaches and areas of expertise. Virtual platforms create spaces for underrepresented groups within radiology training, such as women and BIPOC (Black, Indigenous, and people of color) trainees, through community building and mentorship across training programs. While the value of in-person networking cannot be overstated, virtual platforms offer an alternative that programs should continue to use.

There are many advantages to virtual platforms, but should radiology conferences and readouts stay entirely virtual? Probably not, as the personal connections and mentorship between residents and attendings suffer without face-to-face interaction (5). Worse, when used ineffectively, virtual readouts result in residents functioning as scribes. In one survey of 140 radiology chief residents, the majority of respondents indicated that they preferred in-person educational conferences over videoconferencing platforms (6). So, while adapting the virtual platform to a post–COVID-19 "normal" would likely be beneficial, continuing with solely virtual lectures is not recommended.

In addition to virtual platforms, advances in informatics-based education has led to the creation of simulated readout experiences to combat decreased volume and to augment resident exposure (7). In these models, attendings created educational case lists to be viewed on the PACS in the form of "daily" readouts. Although the necessity for simulated readouts will vanish, informatics-based education has lasting use. Residents could refresh their knowledge before a new rotation or independent call. In

RadioGraphics 2021; 41:E71–E72
https://doi.org/10.1148/rg.2021210030

From the Mallinckrodt Institute of Radiology, Washington University School of Medicine, 510 S Kingshighway Blvd, Campus Box 8131, St Louis, MO 63110 (M.H.L., D.H.B.); and Department of Radiology, University of Alabama at Birmingham, Birmingham, Ala (C.A.W.). Received February 12, 2021; accepted February 12. All authors have disclosed no relevant relationships. **Address correspondence to** M.H.L. (e-mail: *mlanier@wustl.edu*).

addition, these lists could be used as preparation for daily case conferences or short "case of the day" examples, where residents preview cases and generate reports to compare with their peers in a flipped classroom model. In one study that examined this learning strategy, the majority of residents believed that their knowledge and confidence improved with this method and expressed strong interest in continuing this strategy after the pandemic (8). Informatics-based education, when used effectively, integrates active participation into everyday didactics, a key maxim of adult learning (1).

The past year demonstrated the remarkable resilience of our educators and trainees in adapting quickly to the new and ever-changing demands forced by the COVID-19 pandemic. Program directors and educators have a lot to consider as the return to in-person education renders many of the changes made during the pandemic irrelevant. However, educators would be remiss if they do not identify the silver lining and evaluate the opportunities afforded through change.

References

1. Collins J. Education techniques for lifelong learning: principles of adult learning. RadioGraphics 2004;24(5):1483–1489.
2. Cox CW, Gunderman RB. Andragogic approaches to continuing medical education. Acad Radiol 2017;24(10):1325–1326.
3. Ge L, Chen Y, Yan C, Chen Z, Liu J. Effectiveness of flipped classroom vs traditional lectures in radiology education: a meta-analysis. Medicine (Baltimore) 2020;99(40):e22430.
4. Wu X, Peterson RB, Gadde JA, Baugnon KL, Mullins ME, Allen JW. Winter is here: a case study in updating the neuroradiology didactic curriculum through a gamification of thrones solution. J Am Coll Radiol 2020;17(11):1485–1490.
5. Chertoff JD, Zarzour JG, Morgan DE, Lewis PJ, Canon CL, Harvey JA. The early influence and effects of the coronavirus disease 2019 (COVID-19) pandemic on resident education and adaptations. J Am Coll Radiol 2020;17(10):1322–1328.
6. Hoegger MJ, Shetty AS, Denner DR, et al. A snapshot of radiology training during the early COVID-19 pandemic. Curr Probl Diagn Radiol 2020. 10.1067/j.cpradiol.2020.06.012. Published online June 29, 2020.
7. Recht MP, Fefferman NR, Bittman ME, et al. Preserving radiology resident education during the COVID-19 pandemic: the simulated daily readout. Acad Radiol 2020;27(8):1154–1161.
8. McRoy C, Patel L, Gaddam DS, et al. Radiology education in the time of COVID-19: a novel distance learning workstation experience for residents. Acad Radiol 2020;27(10):1467–1474.