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Journal
Journal of Graduate Medical Education, 6(2)

ISSN
1949-8349

Authors
Chretien, Katherine C
Yarris, Lalena M
Lin, Michelle

Publication Date
2014-06-01

DOI
10.4300/jgme-d-14-00157.1

Peer reviewed

Technology in Graduate Medical Education: Shifting the Paradigm and Advancing the Field

Katherine C. Chretien, MD
Lalena M. Yarris, MD, MCR
Michelle Lin, MD

Picture this: You are giving an invited talk at a medical conference. You look out at the audience only to see many people with their heads down, buried in their smartphones or tablets, fingers flying furiously. What is your reaction? For some, it may be annoyance. Why are they here if they are not interested in listening? But for others, it might be satisfaction in realizing that their talk is interesting enough to be "live-Tweeted" (key points distilled into 140-character–limited messages, shared with the Twitter world). Here, a shift in paradigm highlights the contrast between the challenges and the opportunities afforded by technology.

In this issue of the *Journal of Graduate Medical Education*, 2 articles address emerging uses of technology in graduate medical education (GME). In "Smartphones, Trainees, and Mobile Education: Implications for Graduate Medical Education," Short et al[1] review the many ways that mobile phone applications (apps) can be used for education and bedside care to complement traditional in-classroom teaching approaches. Although the initial impulse of some educators may be to equate trainee smartphone or tablet use on rounds with distraction, the myriad educational uses for mobile devices highlighted by Short and colleagues should prompt us to consider the benefits of a paradigm shift. Are we taking full advantage of teaching through mobile platforms? Are we missing out on critical opportunities to reach our learners? We propose that the "teachable moment" has expanded. Medical educators have historically sought to harness teachable moments—or opportunities for learner-educator interaction inspired by notable patient care scenarios—as anchors for teaching content in a way that is engaging and memorable to learners. Now, every time a learner gets onto a smartphone device is an opportunity for a teachable moment about finding and accessing information to help us provide care and learn more effectively.

In the second technology-related paper in this issue, "Use of a Secure Social Media Platform to Facilitate Reflection in a Residency Program," Bernard et al[2] describe the use of a secure social media platform with similarities to popular social networks, such as Facebook, to facilitate reflection among residents. Although social media, specifically blogs, have been shown to facilitate reflection in undergraduate medical education,[3,4] with trainees achieving similar levels of reflection as a comparison group who reflected in small groups,[3] this study extended the application of using social media for reflection to GME. These studies show that reflection, traditionally done privately or among small groups, can be translated to a larger group in an asynchronous fashion through technology and can extend the reach of faculty. These social platforms can also allow faculty to monitor and address the "hidden curriculum" (the unwritten and unintended learning that occurs during training) as sentinel events are documented and discussed with faculty and peers, such as, "My team was making jokes about a patient, and I felt guilty for laughing along."[4] The strengths of social media—to promote asynchronous interaction and sharing among members near and far—can be used to achieve specific learning objectives.

These 2 highlighted articles contribute to a growing body of literature that suggests that technology uses in GME, and medical education in general, are not a fad but part of the future of teaching and learning.[5–7] A few medical schools have transitioned to an all-digital learning platform. Incoming students at the University of California, Irvine are given iPads preloaded with digital resources, including textbooks and podcasts of lectures; the iPads also have the ability to interface with digital stethoscopes, portable ultrasound technology, and encrypted electronic health records. University of California, Irvine reported its first cohort of students scored an average of 23% higher on the United States Medical Licensing Examination Step 1 compared with previous classes despite similar baseline academic performance.[8] Another example is the application of wikis, which are websites that allow collaborative editing of content and structure by its users, in medical education. Wikis have been used to organize administrative

Katherine C. Chretien, MD, is Chief, Hospitalist Section, Washington DC VA Medical Center, and Associate Professor of Medicine, George Washington University School of Medicine and Health Sciences; **Lalena M. Yarris, MD, MCR,** is Associate Professor and Director of Emergency Medicine Residency and Education Fellowship Programs, Oregon Health & Science University; and **Michelle Lin, MD,** is Associate Professor of Emergency Medicine and Academy Endowed Chair for Emergency Medicine Education, University of California, San Francisco.

Corresponding author: Katherine C. Chretien, MD, Washington DC VA Medical Center, 50 Irving Street, NW, Medical Service (111), Washington, DC 20422, katherine.chretien@va.gov

DOI: http://dx.doi.org/10.4300/JGME-D-14-00157.1

and educational information in an internal medicine residency with improved resident perception of workflow.[9] A wiki-based journal club, created and managed by residents, provides open, user-reviewed summaries of landmark trials.[10]

With this rapid growth of novel technologies, scholarly educators should view these innovations as merely tools. Deciding on the best-fit tool to match an educational purpose requires a thoughtful pedagogic approach to achieve desired learning outcomes. Educational need should drive technology use, and not vice versa.

As these technologies become more mainstream in medical education, a broad research agenda should move beyond research that simply compares instructional methods and instead should delve into the complexities of a field that involves cognitive science, principles of multimedia design, and learning theories. The 2007 Association of American Medical Colleges' expert consensus white paper on the "Effective Use of Educational Technology in Medical Education" provides additional research agenda questions within a framework: "Simple answers are unlikely. Rather, solutions will be contingent upon multiple factors including learner attributes, desired learning outcomes, institutional characteristics, and other factors in the learning environment."[7]

We add the following questions that should be considered by the GME community:

- What are the most effective models of new technology to promote lifelong learning?
- Can targeted learning be individualized using new technology?
- Are there metrics to determine the quality and validity of open access, online content in medical education?
- Can technologies be harnessed to assess competencies and Milestones?
- How do we use technology to facilitate patient-centered care (eg, communication, patient education, shared decision making)?
- How can the electronic health record serve as a learning tool for residents?
- What are the standards of professionalism and how does one teach them to learners in this new age of open, collaborative social media?
- Can we establish standards for sharing patient information via technology and social media?
- From the perspective of a "digital educator," how can one demonstrate scholarship for faculty promotion and tenure considerations?

As technology and GME continue to evolve in tandem, educators and scholars are challenged with discovering best practices for teaching and learning through creativity, shifting the "teachable moment" paradigm, and conducting rigorous scholarly inquiry. Furthermore, there is a need for faculty development to learn the foundational aspects of different technological tools and to share best practice models. As educators, we should be asking ourselves: How can we seize the opportunities to reach our learners and expand our traditional definitions of "the teachable moment?" How can we harness technology to meet our needs? How can we advance the field of educational technologies?

We invite *JGME* readers to contribute to this discussion by sharing your thoughts and reactions to these questions by sending your Letters to the Editor (limited to 500 words) to jgme@acgme.org, or by sending a Tweet to @JournalofGME. We will collate those answers and responses in an upcoming issue.

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