Original Investigation

Anonymity and Electronics: Adapting Preparation for Radiology Resident Examination

Teresa Chapman, MD, Janet R. Reid, MD, FRCPC, Erin E. O'Conner, MD

Rationale and Objectives: Diagnostic radiology resident assessment has evolved from a traditional oral examination to computerized testing. Teaching faculty struggle to reconcile the differences between traditional teaching methods and residents' new preferences for computerized testing models generated by new examination styles. We aim to summarize the collective experiences of senior residents at three different teaching hospitals who participated in case review sessions using a computer-based, interactive, anonymous teaching tool, rather than the Socratic method.

Materials and Methods: Feedback was collected from radiology residents following participation in a senior resident case review session using Nearpod, which allows residents to anonymously respond to the teaching material.

Results: Subjective resident feedback was uniformly enthusiastic. Ninety percent of residents favor a case-based board review incorporating multiple-choice questions, and 94% favor an anonymous response system.

Conclusions: Nearpod allows for inclusion of multiple-choice questions while also providing direct feedback to the teaching faculty, helping to direct the instruction and clarify residents' gaps in knowledge before the Core Examination.

Key Words: Resident education; examination; assessment; millennial; audience response.

INTRODUCTION

In 2013, substantive measures were implemented to change the assessment method used for board certification of diagnostic radiologists. These changes created a gap between how radiology faculty members have traditionally taught residents and how residents are now assessed for board certification. Here, we discuss how synchrony between faculty preparation of our residents for board certification testing can be achieved using audience response systems on portable computing devices, in an anonymous manner.

Diagnostic radiology candidates undergoing assessment for initial certification by the American Board of Radiology (ABR) have now transitioned from the long-standing certification process including an oral qualifying examination as the third and final step, to an assessment using two computerized examinations (1). First, the Core Examination is offered 36 months after commencement of their radiology residency training. This examination is administered over a 2-day period and assesses comprehension of anatomy, pathophysiology, all aspects of diagnostic radiology, and physics concepts relevant to diagnostic radiology. Categories tested include the following: breast imaging, cardiac, computed tomography, gastrointestinal, interventional radiology, magnetic resonance imaging, musculoskeletal, neuroradiology, nuclear medicine, pediatrics, physics, radiography or fluoroscopy, reproductive endocrinology, Radioisotope Safety Exam, safety, thoracic, ultrasound, and urinary. Whereas multiple-choice questions assessing the application of physics in radiology are integrated into each category, their composite score is calculated as a separate component of the examination score (2). If a candidate fails up to five categories, he or she must repeat testing in these categories. If a candidate fails more than five categories, the entire examination must be repeated (2). A candidate must pass the Core Examination before being eligible to take the Certifying Examination. The Certifying Examination can be taken 15 months after completion of diagnostic radiology residency (3).

Historically, fourth-year residents in many programs were permitted time off from clinical duties to study for the certifying oral board examination (4). In 2003, the Diagnostic Radiology Residency Review Committee of the Accreditation Council for Graduate Medical Education declared that a requirement for radiology residency training will be "full time participation by the residents in clinical and didactic activities . . . at all levels of training, including the final year of residency" (5). Subsequently in 2007, the Association of Program Directors in Radiology (APDR) asserted that with

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From the Radiology Department, Seattle Children's Hospital, Mail Stop MA.07.220, Seattle, WA 98145 (T.C.); Radiology Department, Children's Hospital of Philadelphia (J.R.R.); Radiology Department, Temple University Health System, Philadelphia, Pennsylvania (E.E.OC.). Received January 13, 2016; revised November 21, 2016; accepted January 8, 2017. **Address correspondence to:** T.C. e-mail: teresa.chapman@seattlechildrens.org

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changes and new requirements coming from the ABR and the Residency Review Committee, programs must adapt to stay compliant and current. The APDR states, "The ABR Core Examination is a different type of examination requiring basic to intermediate knowledge . . . based on 3 years of study in the core curriculum. Furthermore, although the examination is image-rich, it is computer-based, requiring no need to prepare for the 'boardsmanship' aspect of the traditional oral examination." The APDR encourages programs to provide case-based review sessions throughout residency, including the time before the core examination, to enhance resident training and assist in examination preparation (5).

The transition to a new method of testing for certification presents radiology faculty with the challenge of adapting to the new method. Although radiology residents continue to request review sessions given by their teaching faculty to prepare for the Core Examination, resident enthusiasm for the traditionally used Socratic method has waned. The Socratic method, also known in radiology as the "hot-seat" format, calls for a single resident to interpret as his or her peers observe. This exercise may not be as beneficial for third-year radiology residents preparing for their Core Examination. The Core Examination is an electronic examination replete with diagnostic images. Its arrival has prompted radiology residents to request teaching that accommodates the changes that have occurred in the method of testing. As our millennial learners embrace digital teaching methods (6,7), we were compelled to survey residents to learn the preference rate for a new approach to teaching radiology residents about the core topics. In this article, we describe the observations of academic faculty at three different medical centers within the United States in providing a board-review session using an online teaching tool that provides two features that are distinct from the conventional "hot-seat" method: (1) portable computing devices (laptop, tablet, smart phone) are used to respond to questions, participate in quizzes and polls, and annotate and draw on images; and (2) individual responses provided by individual residents for each case presented are anonymous.

METHODS

Faculty involved were subspecialized radiologists (two in pediatric radiology, one in neuroradiology) with 9–18 years' experience teaching residents, recruited by their home institution's post-graduate year 4 class to provide unknown diagnostic imaging cases for the specific purpose of preparing them for the Core Examination. None of the teaching faculty was aware of the precise content that would be covered by the Core Examination. Cases to be included in the board review were incorporated into a web-based platform (Nearpod, https://nearpod.com) that allows for content traditionally shown through programs such as PowerPoint and Keynote to become an interactive session where learners can submit responses to questions posed in the teacher's presentation on a portable computing device and annotate an image. Answers submitted by learners can be viewed by the teacher, yet can remain undisclosed to the audience and anonymous if desired. This allows the teacher to monitor and measure the learner's results on both an individual and a collective basis (Figs 1–3).

Approval of this study was obtained by each of the three relevant institutional review boards. The Nearpod teaching conferences were held in the spring season (February through June) of each year for interested post-graduate year 4 residents. Residents were asked to bring a laptop computer, tablet computer, or smart phone. Electronic devices were not provided. Instructions on accessing the Nearpod website or downloading the Nearpod application were provided in advance. During their review sessions, each lasting 1–3 hours, radiologists covered as many topics as possible. The case content was at the discretion of the teacher at each individual site. Activity types and numbers were as follows: center #1, 3-hour session, 37 cases, 80 activity slides (70% open-ended questions, 20% multiple-choice polls, 10% image annotation); center #2, 1-hour session, 10 cases, 11 activity slides (50% multiple-choice polls, 50% open-ended questions); and center #3, 1-hour and 15-minute session, 25 cases, 27 activity slides (60% multiple-choice polls, 40% open-ended questions). Individual resident performance was not tracked; the sessions were educational only and not intended for formal grading, although performance data are collected by the software program and are available for teachers to review during and after the session.

Following the review sessions, residents were provided a survey link through electronic mail. The survey was optional and anonymous. Residents were encouraged to offer comments, although comments were not mandatory. The survey instrument is shown in Table 1. Survey responses across the three centers were tabulated in an Excel spreadsheet.

RESULTS

Forty-three total residents participated in the review sessions. Thirty-one residents responded to the survey, for a 72% response rate. Survey answers are summarized in Table 2. Subjective resident feedback was largely enthusiastic, but some opposing views were presented as well. Whereas 90% of residents surveyed prefer a board review session incorporating multiple-choice questions, 10% prefer the traditional Socratic method. Similarly, 32% of residents surveyed prefer the Socratic method to a case-based didactic review only.

Comments in favor of conducting a board review session with Nearpod include the following examples: "I like to see the public responses to see where I stand in the group or see if I was way out there"; "If it is all just multiple choice, it makes it too easy. I need to do some open-ended and differential diagnosis questions to stretch myself and make better mental connections for improved retention"; and "I like active review after the question is submitted. It helps with critical thinking while my thought process is still very fresh in my mind. Sometimes reviewing after the fact, we forget why we reasoned ourselves into a wrong answer." A few comments spoke to the efficiency of a board review session conducted with Nearpod, as summarized here: "This streamlines the