Original Investigation

Why Isn't There More High-fidelity Simulation Training in Diagnostic Radiology? Results of a Survey of Academic Radiologists

Tessa S. Cook, MD PhD, Jessica Hernandez, MD, Mary Scanlon, MD, Curtis Langlotz, MD PhD, Chun-Der L. Li, MD

Rationale and Objectives: Despite its increasing use in training other medical specialties, high-fidelity simulation to prepare diagnostic radiology residents for call remains an underused educational resource. To attempt to characterize the barriers toward adoption of this technology, we conducted a survey of academic radiologists and radiology trainees.

Materials and Methods: An Institutional Review Board-approved survey was distributed to the Association of University Radiologists members via e-mail. Survey results were collected electronically, tabulated, and analyzed.

Results: A total of 68 survey responses representing 51 programs were received from program directors, department chairs, chief residents, and program administrators. The most common form of educational activity for resident call preparation was lectures. Faculty supervised "baby call" was also widely reported. Actual simulated call environments were quite rare with only three programs reporting this type of educational activity. Barriers to the use of simulation include lack of faculty time, lack of faculty expertise, and lack of perceived need.

Conclusions: High-fidelity simulation can be used to mimic the high-stress, high-stakes independent call environment that the typical radiology resident encounters during the second year of training, and can provide objective data for program directors to assess the Accreditation Council of Graduate Medical Education milestones. We predict that this technology will begin to supplement traditional diagnostic radiology teaching methods and to improve patient care and safety in the next decade.

Key Words: High-fidelity simulation; radiology resident education; call preparedness.

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INTRODUCTION

The use of simulation as a training tool in medicine has grown dramatically in recent years. Between 2000 and 2009, the number of simulation centers in the United States increased from approximately 100 to over 1000 (1,2). In particular, this growth in simulation training has also borne out a transition from low-fidelity to high-fidelity simulation (HFS) (3,4). HFS is defined as immersing participants into realistic scenarios that mimic real-life encounters. In health care, HFS is implemented using scenarios with tools and techniques and real-time feedback similar or identical to those that would be experienced during actual patient care situations. Medical disciplines such as surgery, anesthesia, obstetrics, emergency medicine, internal medicine, and nursing are using high-fidelity mannequins, sophisticated environments, and virtual reality computer software to simulate disease processes and allow trainees to safely learn and practice complex procedures as well as develop technical skill sets (5–11). The impact of HFS training has been demonstrated in the literature. Senior anesthesiology residents were more effective in weaning patients from cardiopulmonary bypass after undergoing an HFS training session rather than an interactive lecture (9). Nurses and obstetrics residents performed better in managing

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From the Department of Radiology, Hospital of the University of Pennsylvania, 3400 Spruce Street, 1 Silverstein Radiology, Philadelphia, PA 19104 (T.S.C., M.S., C.L., C.-D.L.L.); Department of Emergency Medicine, Albert Einstein Medical Center, Philadelphia, PA (J.H.); Department of Radiology, Stanford University, Palo Alto, California (C.L.); Texas Neuroradiology, PA, Dallas, Texas (C.-D.L.L.). Received June 19, 2015; revised March 28, 2016; accepted March 30, 2016. Please note that the addresses for the coauthors are present addresses; this work was performed at the corresponding author's address. Funding: Drs. Li and Cook were co-principal investigators (PIs) on an AUR/RSNA Education Scholar Grant awarded for the 2013–2014 academic year. Drs. Hernandez, Scanlon and Langlotz were associates and mentors on the grant. **Address correspondence to:** T.S.C. e-mail: tessa.cook@uphs.upenn.edu

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patients with shoulder dystocia and eclampsia after dedicated HFS training rather than lectures combined with hands-on demonstrations alone (8). Furthermore, there are programs conducting fellowships that focus entirely only on training physicians to use simulation medicine as an integral teaching tool (12).

Within radiology, simulation was recognized over a decade ago as an important technique for teaching procedures in a safe environment (13). Life-like simulators allow trainees to learn procedures such as guidewire and catheter insertion for vascular interventions (14–17). In addition, many residency programs are using simulation environments to give trainees practice in appropriately managing patients who are having adverse reactions to intravenous contrast (18–24). A number of researchers have shown that simulation training improves learning and retention of complex skills over more traditional educational methods such as lectures and demonstrations (25–27). A cost analysis comparing high-fidelity contrast reaction management training to traditional lecture series demonstrated that the higher cost of developing and implementing the former was offset by the potential high cost of morbidity associated with a mismanaged contrast reaction (22). A dedicated simulation laboratory course to educate radiology residents on the management of tension pneumothorax, massive hemorrhage, and contrast reactions demonstrated improved post-test scores after the immersion training (23).

However, despite a proven impact and a rise in popularity in procedurally intensive subspecialties, simulation training does not have a great role in the development of image interpretation skills within diagnostic radiology. In the past, multiple research groups have developed computer-based modules for radiology resident education (28–33). These simulated sessions have the potential to serve as training venues for residents prior to independent call but are not widely implemented. The training of radiology residents has traditionally followed an apprenticeship model in which residents are paired with an attending radiologist to review and discuss clinical cases after the resident has spent some time reviewing each case alone. After 1 year of this apprenticeship, residents are expected to enter the call pool and independently interpret studies during off hours. Before taking independent call, there is little standardized assessment as to whether a resident is adequately prepared to provide interpretations that impact patient care, and there are few venues in which to acclimate to the call environment. Despite the fact that studies have shown a negative effect on interpretation accuracy from phone call interruptions, there is little to no structured training in how to manage the time pressures often encountered while on call (34). In addition, there is little formalized training in communication and professionalism, two Accreditation Council of Graduate Medical Education (ACGME) core competencies that have been deemed important for patient care and interdepartmental relationships (35). The ACGME's Diagnostic Radiology Milestones offer a framework for residents' progress through training and also include assessment of interpersonal and communication skills, as well as professionalism (36).

In the present study, we sought to gather attitudes from both radiology faculty and their trainees on the topic of simulation training in radiology to identify current perceptions, perceived barriers, and challenges. We also consider how the recent change in the American Board of Radiology licensure and certification process may impact the role of HFS training in radiology in the next decade.

MATERIALS AND METHODS

An Institutional Review Board-approved survey was distributed to radiology residency programs through the Association of University Radiologists e-mail distribution list. Program directors, faculty, and trainees (both residents and fellows) were invited to respond. The survey asked how programs currently train residents for independent call, whether they receive specific training on communication and professionalism, how on-call performance is assessed (both now and within the framework of the new ACGME milestones), and what barriers to a simulated call environment existed. The survey questions are summarized in Table 1.

The goal of the survey was not to identify the flaws in the conventional apprenticeship approach to preparing residents for call, but rather to explore the penetration within radiology of simulation-based training methods that have gained substantial traction in nonradiology specialties, and identify some possible reasons why a similar degree of adoption has not yet been achieved in our specialty. In particular, as the implementation of HFS training allows for training in aspects of call coverage other than radiology interpretation (such as dealing with interruptions and distractions as well as communicating with other members of the health care team), we sought to explore existing aspects of training surrounding these noninterpretive skills.

RESULTS

Demographics of Survey Respondents

A total of 68 survey responses were received from 51 unique residency programs; this total represents approximately a 31% response rate, based on the 166 diagnostic radiology residency programs in the United States that offered postgraduate year 2 (PGY-2) positions in the National Residency Matching Program in 2015 (37). Figure 1 shows the approximate geographic distribution of the programs that responded.

A single response was received from 40 of the 51 programs. The respondents from 36 out of 51 (71%) programs self-identified as program directors, assistant program directors, or other faculty members. From 3 out of 51 (6%) programs, respondents self-identified as residents (one was a chief resident). One out of 51 (2%) program responses came from a nonphysician program administrator.

The remaining 11 programs submitted a total of 28 additional responses. Program directors or assistant program directors responded from 8 out of 51 (16%) programs, and their numeric