Medical Student Radiology Education: Summary and Recommendations From a National Survey of Medical School and Radiology Department Leadership

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The ACR Task Force on Medical Student Education in Radiology, in partnership with the Alliance of Medical Student Educators in Radiology, investigated the current status of how and to what extent medical imaging was being taught in medical schools. The task force executed a 3-part survey of medical school deans, radiology department chairs, and intern physicians. The results provided an updated understanding of the status of radiology education in medical schools in the United States. This summary includes recommendations about how individual radiology departments and ACR members can assist in advancing the specialty of diagnostic radiology through medical student education.

Key Words: Radiology education, medical imaging education, radiology clerkship, appropriateness criteria, medical student

J Am Coll Radiol 2014;■:■-■. *Copyright © 2014 American College of Radiology*

INTRODUCTION

Imaging is central to the practice of modern medicine. It can be used to detect disease, direct clinical management, guide procedures, and deliver therapies. Yet radiology is frequently underrepresented in the formal curricula of medical schools and taught by nonradiologists with educational materials that do not include the latest technological advances or reflect the current role of radiologists in the patient care continuum. More specifically, several recent surveys confirm that only 10% to 25% of US medical school graduates are required to take radiology as a clinical rotation [1,2].

The ACR and the Alliance of Medical Student Educators in Radiology (AMSER) conducted a survey of the US medical school system to assess the current status of radiology education. Responses were elicited from medical school deans, radiology department chairs, and intern physicians. Selected results of the survey and recommendations to enhance the quality of radiology education in our medical schools are reported here.

ACR AND AMSER SURVEY METHODOLOGY

Members of the ACR and AMSER created a detailed survey that was sent electronically to all US members of the Society of Chairs of Academic Radiology Departments (n = 124), US allopathic medical school deans (n = 138), and members of the American Medical Student Association who graduated from medical school in 2011 and 2012 (n = 4,596). The survey was conducted from November 1 to December 18, 2012. The response rate was 46% for the survey of chairs (57 of 124), 24% for the survey of deans (33 of 138), and 1.4% for the survey of interns (66 of 4,596). Because of the low response rate for the survey of interns, these data were not included in the analysis. The survey data collected from the deans and chairs, however, reflect a balanced representation of US allopathic medical schools: $\chi^2(1) = 1.015$ ($P = .314$) and $\chi^2(1) = 3.274$ ($P = .351$) for class size and geography, respectively ($[1 - \beta] > .8$ for both).

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1546-1440/14/$36.00 • http://dx.doi.org/10.1016/j.jacr.2014.01.012

For the data analysis of open-ended survey questions, one researcher (KLK) read all the responses and identified recurrent themes that captured the breadth of the respondents' views. This provided a thematic framework that was used by two researchers (CMS and KLK) who independently coded the comments.

SELECTED SURVEY RESULTS

The ACR-AMSER task force selected the following survey results to initiate discussion and support specific and actionable recommendations for implementation in today's medical education environment. Full survey results are provided online.

Who Is Teaching Radiology and Imaging to Medical Students?

Radiologists often advocate that it is essential for medical students to learn medical imaging from imaging-trained experts; however, survey responses suggest that nonradiologists commonly teach imaging in both preclinical and clinical settings. The exact percentage could not be calculated from the present survey.

On a 5-point, Likert-type scale, 58% of chairs and 53% of deans reported that more or much more radiologist involvement is needed with medical imaging education. However, chairs reported a significantly greater need than deans for more imaging instruction by radiologists ($t[81] = -2.277$, $P = .025$, $r = 0.25$ for comparison of means on the 5-point, Likert-type scale). Furthermore, majorities of both chairs and deans indicated that more radiologists need to be available to teach. Only 57% of chairs agreed or strongly agreed that clinical expectations prevent radiology faculty members' involvement in student education, suggesting that there are other significant obstacles in addition to the availability of professional time.

Most radiology departments have only a select few radiologists engaged in medical student teaching, substantiated by a mean chairs' estimate of $14 \pm 4\%$ (median, 10%) of their departments' total faculty full-time equivalents dedicated to medical student education. There was no significant difference in the percentage of full-time equivalents devoted to medical student education between large and small medical schools (defined as a class size of ≥ 150 or <150 students, respectively) ($t[46[= -0.606$, $P = .548$) or between faculty size ($r = -0.105$, $P = .479$).

Alternatives to Radiologists Teaching Imaging

Deans were significantly more likely than chairs to indicate that nonradiologists could adequately teach medical imaging to medical students ($\chi^2[1] = 50.606$; $P < .001$; odds ratio, 153.06). Seventy-five percent (24 of 32) of deans believed that nonradiologists can adequately teach basic imaging skills, supported by comments shown in Table 1a (available online). Some deans qualified their statements, citing specific circumstances such as orthopedists' teaching skeletal imaging (Table 1a).

Conversely, 98% of chairs (51 of 52) reported that nonradiologists could not adequately teach medical students medical imaging. Fifty-eight percent (29 of 50 comments) cited limited expertise, inadequate training, and a lack of comprehensive knowledge (Table 1b, available online). Sixteen percent of chairs (8 of 50 comments) cited inaccurate knowledge and the propagation of misconceptions as reasons that nonradiologists cannot adequately teach medical imaging (Table 1b).

How, When, and What Medical Imaging Is Being Taught Today?

The majority of imaging education occurs in clinical rotations, primarily during year 4 and primarily in the form of electives (Tables 2 and 3, available online). Most schools do not offer or require imaging courses during years 1 through 3 (Table 3). Imaging is often incorporated into existing required preclinical courses, most notably during anatomy (Table 4, available online).

During year 3, when many students take their required clerkships, formal medical imaging instruction commonly occurs within core clinical rotations, such as internal medicine, surgery, and or obstetrics and gynecology (Tables 5 and 6, available online). If radiologists are involved, survey results showed that nearly all use traditional methods such as lectures and textbooks, with only half reporting the use of online or interactive digital resources.

How Should Radiology Be Taught and What Should Be Taught?

Both chairs (77% [39 of 51]) and deans (59% [19 of 32]) reported that we need more or much more medical imaging instruction across all 4 years of medical school. No dean or chair respondents reported needing less vertical integration. Sixty-three percent of chairs (33 of 52) agreed or strongly agreed that radiology should be a required medical school course, with a trend toward more chairs (39% [18 of 46]) than deans (20% [6 of 30]) supporting the statement ($\chi^2[1] = 3.076$, $P = .079$).

Chairs and deans were also asked the open-ended survey question "In the next ten years, what changes would you like to see (if any) to how medical imaging is taught to students?" Vertical curricular integration was the most common answer, cited by 44.1% (15 of 34) and 25.6% (22 of 86) of deans and chairs, respectively. Responses such as "Integrated into all four years with teaching by radiologists" and "Increased presence of radiologists teaching in the medical school curriculum" demonstrate not only a desire for increased imaging instruction but that imaging be taught by radiologists, which was the second most desired change by both chairs and deans (Tables 7a and 7b, available online). Although students place great value on image interpretation skills in their imaging education [3], this was not a theme identified by chairs or deans. The third most desired change was greater emphasis on utilization and ACR Appropriateness Criteria® education (Table 7b).

Identified Barriers in Medical Imaging Education

When asked what hinders implementation, the chairs cited radiology faculty time availability, followed by a

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