

Medical Student Usage of the American College of Radiology Appropriateness Criteria

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Rationale and Objectives: Educating medical students on appropriate imaging utilization has been increasingly recognized as important for patient care. The American College of Radiology Appropriateness Criteria (ACR-AC) is designed to support evidence-based imaging examination selection. We sought to assess whether medical students order imaging studies independently, what resources they use for guidance, and whether they use the ACR-AC in clinical practice. A secondary aim was to determine whether increasing familiarity with the ACR-AC could impact student usage.

Materials and Methods: We surveyed third year medical students at a single institution on their imaging practices, familiarity with the ACR-AC, and preferences among available resources to guide proper examination selection. The survey was performed in person before a lecture. We also designed a brief intervention to improve familiarity with the ACR-AC and then reassessed students to determine any effect on utilization.

Results: The response rate for the initial survey was 103 of 109 (94%) and the response rate for the second survey was 99 of 109 (91%). Our initial survey found students initiated imaging orders independently (74 of 100, 74.8%) and consulted resources to assist in examination selection (50 of 74, 67.6%). Students expressed a preference for non-ACR-AC resources, notably UptoDate via its online mobile application. Few students (8 of 71, 11.3%) were familiar with the ACR-AC. After an intervention to increase familiarity with the ACR-AC, student awareness of the ACR-AC increased to 61 of 74 (82.4%). However, usage among those familiar with the resource remained low, 13 of 61 (21.3%) versus 3 of 8 (37.5%).

Conclusions: Use of the ACR-AC was low among third year medical students. After increasing students' familiarity with the ACR-AC, their usage in a clinical setting did not increase. The largest barrier to use may be the lack of a quick, easy to use online mobile application-based interface.

Key Words: Medical student; education; radiology; ACR appropriateness criteria.

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Medical imaging is a critical and growing component of modern medical diagnosis and practice. Over the past 4 decades, advances in diagnostic imaging have contributed greatly to patient care, improving our ability to detect disease, guide procedures, and deliver treatments (1). Most medical specialties now regularly use medical imaging, which has led to a substantial increase in the number of diagnostic imaging examinations performed in recent years (2,3). It is estimated that imaging services have grown at about twice the rate of other health care technologies over the past decade (4).

The increased use of medical imaging comprised examinations that are beneficial to patients' welfare and examinations that could be considered inappropriate to use (4). Several publications have documented that as many as 25%–50% of advanced imaging studies fail to improve patient welfare and may be unnecessary (4–7). This not only contributes to escalating health care costs in the United States (4,8,9) but also exposes patients to unnecessary risks including radiation, contrast-related complications (7,10–14), and unnecessary interventions for incidentalomas (15).

Among a number of factors that contribute to imaging overutilization, physician knowledge gaps regarding imaging safety and appropriateness play an important role (4,16). Studies have shown that referring physicians sometimes lack expertise in determining which tests are most appropriate. For example, Lehnert and Bree (17) found that 26% of computed tomography or magnetic resonance imaging scans performed by primary care physicians were for inappropriate indications. A separate survey of medical house staff found that less than 50% of respondents were able to correctly answer half

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the questions regarding appropriate imaging test choice for specific clinical situations (18). In addition, a number of studies have demonstrated that referring physicians and physician trainees, regardless of specialty, lack knowledge of radiation doses and safety (19–24).

Thus, educating physicians on appropriate imaging utilization and imaging safety has been increasingly recognized as important for patient care and health care cost containment (25–29). Targeted education campaigns have been promoted by a number of medical organizations, including the “Choosing Wisely” and “Image Gently” campaigns (30,31). Efforts have also included the development of electronic order entry systems with integrated clinical decision support systems (16,32). Others have developed free access resources that aim to help physicians select imaging modalities that are safer and more appropriate for their patients. The American College of Radiology (ACR) has developed one of these comprehensive imaging decision support resources called the ACR Appropriateness Criteria (ACR-AC). This free, online, evidence-based, peer-reviewed resource is designed to help referring physicians choose the best imaging examination for more than 200 commonly encountered clinical scenarios (33). It provides an appropriateness rating of each imaging option and most importantly attempts to introduce radiologist knowledge into the decision algorithm before the examination being ordered. Specifically, each potential test is described with a discussion of both its pros and cons including any associated radiation risk and a pertinent literature review regarding each option.

Despite the availability of versions of the ACR-AC since 1993, awareness and utilization of this resource by nonradiologists remains low (1,26,34). For instance, a survey by Bautista et al. (27) found that 1.7% of residents and 3.0% of attending referring physicians reported using the ACR-AC as one of their top three resources for selecting the best imaging technique. Another survey found that 81% of interns across a wide representation of referring specialties had never heard of or used the ACR-AC (35). Unsurprisingly, awareness of this resource is also low among medical students. As most current medical students will become future referring physicians, it is of particular importance that education efforts are directed toward this group. A study by Dillon et al. (29) found that 96% of senior medical students at one institution were not aware of the ACR-AC. A survey of students at multiple US medical schools by Prezzia et al. (28) found that 77% had never heard of the ACR-AC.

The purpose of this study was to assess whether medical students at our institution order imaging studies independently, what resources they use to help in decision making, and whether those familiar with the ACR-AC use the resource in clinical practice. A secondary aim was to determine whether increasing familiarity with the ACR-AC could impact student usage. To our understanding, this is the first study to evaluate medical student use of the ACR-AC within a clinical setting.

MATERIALS AND METHODS

This study was confirmed as exempt-status by our institutional review board.

Survey Design and Administration

A survey was created to assess awareness and use of the ACR-AC as well as imaging practices and preferences among third year medical students. The 11-question survey was created by a team of three authors and then reviewed and edited by two faculty members with extensive experience in educational survey design. The survey comprised questions using a 5-point Likert Scale, yes or no, multiple choice, and free response formats; the survey questions are presented in Tables 1–3.

The survey was distributed on paper, in person to 109 third year medical students (of a class of 150) who were in attendance for a radiology lecture in October 2014, during which the ACR-AC were not discussed. The lecture was part of a weeklong course that occurred midway in third year, between core rotations. The survey was distributed by a member of the third year medical student class who was among the study authors. Surveys were collected anonymously, and students did not indicate their name or identifying information. Participation was optional.

Increasing Student Familiarity with the ACR-AC

At our institution, radiology is taught in an integrated longitudinal fashion over the first 2 years (30 hours). During the third year, students have four radiology lectures that occur in between clinical clerkships that focus on skills for wards. However, the ACR-AC is not currently incorporated into the radiology curriculum until the fourth year, when most medical school class take a 4-week elective focused on appropriate imaging examination selection (100 hours). To introduce third year medical students to the ACR-AC, a lecture describing the purpose, utility, and benefits of the resource was given immediately after the collection of the preintervention survey. The lecture material was presented by two third year medical students (who were study authors) and a radiology faculty member using a PowerPoint presentation. The tutorial also included a live demonstration on how to access and navigate this resource using “right lower quadrant pain” as a clinical vignette. To remind students about this resource, and for those not in attendance, a follow-up e-mail was sent 1 week later to all third year medical students that included the lecture slides and instructions on how to use the ACR-AC. Students were also provided an electronic PowerPoint module on their online course platform as reference material.

Follow-up Survey Design and Administration

A 13-question postintervention survey was designed to evaluate whether this brief intervention had any impact on student use of the ACR-AC and on various imaging

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