Should Radiology Residents Be Taught Evidence-Based Radiology? An Experiment with "The EBR Journal Club"[1]

Marta E. Heilbrun, MD

Rationale and Objectives. Introduce radiology residents to evidence-based radiology (EBR) using a journal club format based on the Radiology Alliance for Health Services Research/American Alliance of Academic Chief Residents in Radiology (RAHSR/A3CR2) Critical Thinking Skills sessions and EBR series of articles published in *Radiology* in 2007.

Materials and Methods. The club began with a presentation outlining the process that would occur in an alternating format, with topics and articles chosen by residents. In session A, questions were rephrased in a Patient/Population, Intervention, Comparison, Outcome format, and a literature search was performed. Articles were discussed in session B, with residents assigned by year to the tasks of article summary, technology assessment, and comparison to checklists (Standards for Reporting of Diagnostic Accuracy, Consolidated Standards of Reporting Trials, or Quality of Reporting of Meta-analysis). The residents collectively assigned a level of evidence to each article, and a scribe provided a summary.

Results. Twenty-two residents participated, with 12/22 (55%) of residents submitting any question, 6/22 (27.3%) submitting more than one question, and 4 residents submitting questions in more than one session. Topics included radiation risk, emergency radiology, screening examinations, modality comparisons, and technology assessment. Of the 31 articles submitted for review, 15 were in radiology journals and 5 were published before 2000. For 2/9 topics searched, no single article that the residents selected was available through our library's subscription service. The maximum level of evidence assigned by residents was level III, ''limited evidence.'' In each session, the residents concluded that they became less confident in the ''right answer.'' They proposed that future reading recommendations come from attendings rather than literature searches.

Conclusion. A journal club format is an effective tool to teach radiology residents EBR principles. Resistance comes from the difficulty in accessing good literature for review and in constructing good review questions.

Key Words. Critical thinking; evidence based radiology; journal club; resident education.

The significant evolution, explosion, and significance of medical imaging in today's practice of medicine has made the process of both teaching and learning clinical and nonclinical radiologic skills a formidable task to accomplish during 4 years of residency (1,2). Practice-based learning and improvement is one of the Accreditation Council for Graduate Medical Education's six general competencies (3) that is particularly relevant to training today's residents in diagnostic radiology, both because of the growth of medical imaging and the cost associated with this imaging (4,5). An introduction to the tools and process of evidence-based radiology (EBR) provides a forum for teaching and promoting practice-based learning in a diagnostic radiology curricula. A resident journal club facilitates the introduction of EBR into a diagnostic radiology resident education program (2,6). However, for such a curriculum to be successful, because it represents a change from traditional didactic and view-box teaching in radiology, it requires significant buy-in from program directors, faculty, and residents. At the 2007 Association of University Radiologists (AUR) meeting sessions on journal clubs, led by the late Ed Staub, MD, two main points were emphasized regarding journal clubs—the first

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[1] From the Department of Radiology, University of Utah, 30 North 1900 East #1A071, Salt Lake City, UT 84132-2140. Received February 6, 2009; accepted June 17, 2009. Supported by GE-AUR Radiology Research Academic Fellowship. **Address correspondence to:** M.E.H. e-mail: marta.heilbrun@hsc.utah.edu

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that food must be provided and the second that it is unreasonable to expect everyone (or even most people) to have done the reading.

The structure from the Radiology Alliance for Health Services Research/American Alliance Chief Residents in Radiology (RAHSR/ACR3) Critical Thinking Skills sessions at the 2007 AUR meeting and the EBR series in *Radiology* (2,6–12) was used as the model for a resurrected resident journal club at our intuition (2,13). Discussion and participation would be motivated by allowing the residents to pick the topics and the articles as well as lead the discussions. The educational experience would be ensured by using the club to introduce basic study design and statistical concepts and subspecialty faculty participation germane to the specific topics would be solicited. Lunch was provided for the conference through the residency director, because this program fulfilled goals of the Accreditation Council for Graduate Medical Education for teaching nonclinical skills.

At the time the conference was slated to begin, our program was coming up on its 5-year Residency Review Committee evaluation. The once-monthly EBR journal club provided the necessary structure and exposure in order to document resident participation in many of the core competencies, including demonstration of appropriate utilization of imaging technologies, continuous learning, practice-based learning, and system-based practice. It was designed to function as a bottom-up/resident-driven experience, rather than top-down/attending-driven experience. It would exploit adult learning principles and possibly identify research projects and quality assessment/improvement projects that could be accomplished by residents. The goal was to use a journal club format as a tool to teach radiology residents nonclinical core competencies using EBR principles.

MATERIALS AND METHODS

The journal club was set up with alternating sessions. In the first session, topics and articles would be identified for critical assessment in a subsequent session. Questions and areas of clinical concern were solicited from the residents via e-mail before the first session. Then, the journal club met during the noon hour, replacing a case conference. After lunch was served, the residents were shown a slide show adapted from the RAHSR critical thinking sessions at the AUR. This slide show went over a brief introduction to the concept and rationale for EBR, how to change a question into the PICO (Patient/Population, Intervention, Comparison, Outcome) format (12), and the criteria for assigning a level of evidence to a report (14). The presentation used as a model the same case presented in the AUR critical thinking session, regarding ''Should FDG PET be routinely used in the preoperative assessment of patients with colorectal liver metastases?'' (15).

Three of the submitted questions were randomly chosen. The steps of setting up the search for articles in PubMed, using the indexing function, MeSH headings, and Boolean operators were reviewed. In mixed postgraduate year groups, the residents reformatted the questions they had submitted into the PICO format. Then, the PICO-formatted question was used as the basis for performing a PubMed search. The resident groups perused the abstracts from their search to choose a list of potential articles for review. The list of articles was electronically submitted to the faculty advisor, using the ''Send to E-mail'' function from within PubMed. In the comment field, the residents were asked to include their question. The question and list of articles with titles and abstracts were then forwarded to the entire group of residents, who voted on which topic and articles they wanted to discuss in the subsequent session. After the vote was complete, links to the full-text articles were sent to the residents, so that they could download the articles themselves. If the articles were not available, the faculty advisor did a search using the MeSH keywords from the articles that had been submitted to find substitute articles. Residents were also given as suggested homework assignments links to the EBR articles from *Radiology*. No explicit discussion of these articles was undertaken, nor was there an assessment as to if the articles were actually read.

As a preface to the critical discussion of the articles, one resident in each class was given an assignment. These assignments were communicated to the residents via e-mail, and the residents were assigned in a random order. If the resident foresaw a conflict with attending their assigned session, he or she was expected to find a classmate to cover. The e-mail assignment included links to the *Radiology* articles and the Evidence Based Radiology website (http://www.evidencebasedradiology.net/), which they had been introduced to in the prior year in a series of didactic lectures on ''Assessing the Literature'' delivered by another faculty member.

A first-year resident was assigned the task of providing a summary of the topic, including what type of studies were described and the major conclusions of the articles (7). A second-year resident was given the task of trying to come up with an appropriate technology assessment (16). The third-year resident was asked to go online and find and use the appropriate checklist to evaluate the article. It was expected that they would find the information on line independently; however, assistance or direction was offered if solicited. The expectation was that Standards for Reporting of Diagnostic Accuracy would be used for studies of diagnostic accuracy, Consolidated Standards of Reporting Trials for randomized clinical trials, and Quality of Reporting of Meta-analysis for meta-analysis. Finally, the fourth-year residents were asked