



# RSNA Teaching and Learning Conference: Summary of Findings<sup>1</sup>

Theresa C. McLoud, MD • George S. Bisset III MD • Linda Bresolin, PhD, MBA, CAE

## Introduction

In April 2005, the Radiological Society of North America (RSNA) convened 55 individuals, representing 15 organizations, as well as some residents to discuss modern adult educational methodologies and to identify what the implications were for radiologic education and how radiologists learn.

## Introductory Session

The meeting began with an overview of the history of medical education presented by John Parboosingh, MB, FRCSC. Dr Parboosingh noted that training in medicine in the 19th century was basically an apprentice system. An individual seeking medical knowledge and training became the protégé of an expert. On-the-job tutoring and training were the norm, and the individual mentor determined the ability of the trainee to practice independently.

In the 20th century, formal and informal continuing medical education (CME) was introduced, along with regulations and accreditation. To practice medicine, individuals were required to master a defined body of knowledge and successfully pass a structured examination.

In the early 21st century, the paradigm is rapidly switching to one of continuing professional development (CPD), in which certification and licensure are ongoing processes that occur throughout one's professional life. Because it has become impossible to master the universe of medical knowledge, the effective medical practitioner is an individual who is able to identify what

he or she needs to know, find the educational resources to remain informed, and demonstrate that lifelong learning process through his or her clinical practices.

## Small Groups

The participants were divided into four groups, each of which considered the following questions: (a) how do you usually learn new information and skills currently and (b) how do you like to learn new information and skills?

Preferred methods of learning varied from person to person, with some formats identified as being positive or negative by different individuals, based on their preferences. Some of the traditional methods of learning (eg, attendance at didactic lectures, reading journal articles) persist, but participants generally agreed that there is less time to engage in these activities and that in many cases they are less effective than other mechanisms. One group felt that private practitioners continued to rely more on these traditional methods than did their academic counterparts.

Most participants cited an increasing reliance on electronic tools for learning, often at the point of care. Use of Internet searches and electronic references to find the answer to questions as they arise in the course of practice or other applied activities, such as preparing lectures, represents an increasingly favored strategy for learning "on the fly." Participants recognized, however, that electronic learning tools vary widely in quality

**Abbreviations:** CME = continuing medical education, CPD = continuing professional development, IT = information technology, MOC = maintenance of certification

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and ease of use and that they are difficult to construct and maintain.

Individualized learning was also felt to be highly effective when it occurred through formal mentorship or informal peer-to-peer exchanges. Having opportunities to “practice” with others was cited as a highly beneficial way to consolidate knowledge.

Finally, many participants recognized the motivational effects of examinations and other forms of external assessment in prompting individuals to learn new skills and information.

### Plenary Session 1: Learning

The afternoon session began with a discussion by Beverly Wood, MD, PhD, on general principles in adult learning. Because adult learners are in control of their learning (choosing what to learn and when to learn it), they are often highly motivated; however, they tend to be pragmatic. Learning is most often directed to information that is immediately applicable to the learner’s own situation or educational needs. Learning is most effective when it is interactive and promotes behavior change effected in manageable increments. Preferred learning styles vary. Some individuals learn visually and others by auditory means. Some must have a hands-on experience to retain the information effectively. Retention is improved if more of the individual’s senses are engaged and if the learning process is more active.

The next presentations summarized the experiences from other disciplines relevant to teaching and learning in the radiologic sciences. Ehsan Samei, PhD, presented information on perceptual learning. Medical images are complex and generally involve the interpretation of two-dimensional renderings. The science of medical image perception investigates and analyzes the nature of perceptual error; the impact of image quality, ergonomics, and computer-aided diagnosis on interpretation; models of image perception; and how expertise shapes the way images are approached by radiologists. The results of such investigations have provided information about optimal display parameters, ambient lighting, and search strategies for imaging interpretation.

Steven Dawson, MD, lectured about the use of medical simulators in learning and medical training. Medical simulators provide “the ability to learn safely from complications and to be able to make mistakes without consequences.” Medical *simulations* create a virtual environment in which medical scenarios and team-training exercises can occur. Medical *simulators* provide physical systems with which the individual trainee can practice procedures before attempting them on human patients. Both have been shown to improve

learning, reduce errors, and improve accuracy. Some medical simulators are now commercially available. Others are in development. Industry needs guidance from radiologists regarding the types of simulations and simulators that should be developed.

The topic of the lecture by Peter Greene, MD, was “IT-Assisted Learning” (IT = information technology). He reviewed what is known about the efficacy of e-learning and stressed that e-learning that is interactive and relevant to daily life is the most effective. IT-assisted learning also provides the opportunity to collect metrics and outcome data to support accountability and research. Dr Greene showed the participants work that is being done at Dartmouth University in the development of cases with “virtual patients.” Much IT-based medical education is now designed according to standards maintained by the MedBiquitous Consortium, of which Dr Greene is the executive director. Adoption of these standards allows migration of educational content developed for one platform to other software platforms, so that it can be reused for multiple educational purposes.

### Small Groups

Following these presentations, the participants reconvened in their small groups to discuss the following questions: (a) based on what you have heard today, now how would you like to learn new information and skills and (b) what resources would you need to be able to learn that way?

Participants felt that leading radiology organizations and societies must show leadership and invest significant resources to move the radiology community from its current models of passive presentation of material to active seeking of knowledge and interactive learning. The following issues were discussed:

1. Medical simulation and simulators provide a significant opportunity for hands-on learning that can be highly effective. Participants encouraged the RSNA to invest in medical simulation and simulation-based training, perhaps by establishing a national training center, as well as by encouraging training centers to develop regional simulator capabilities.

2. Self-assessment in learning will play a more significant role. Learners will need to receive feedback about their areas of strength, as well as their areas of need, and seek out learning opportunities to address the deficiencies.

3. Learning that is “embedded” in the day-to-day activities of the radiologist will be increasingly important, and tools should be developed that will allow clinicians to ask and receive answers to questions at the point of care. Metrics for tracking that learning will also need to be developed.

4. High-quality Web-based interactive educational tools are needed to support distance learning that is tailored to the needs of the individual learner.

5. Societies need to support “communities of learners”—that is, individuals with similar interests or educational needs—interacting virtually to share resources, insights, and educational questions.

### Plenary Session 2: Learning Models and Research

The next morning, presenters addressed what radiologists could learn concerning the educational process and adult learning from other disciplines and medical specialties, as well as from medical education research.

William Hendee, PhD, discussed the role that knowledge about physics and other sciences, such as engineering and informatics, plays in radiologic education. He reviewed the maintenance of certification (MOC) requirements that have been adopted by the American Board of Radiology for medical physicists, including the mechanism for documenting “self-directed education projects.” Twenty of these individualized, self-determined learning projects are required over the 10-year MOC cycle. Dr Hendee then reviewed the declining level of physics knowledge among radiology residents and practicing radiologists, discussing nine “challenges to radiologists’ knowledge of physics.” Dr Hendee challenged the group to identify strategies and to develop resources to improve the level of physics and basic science knowledge among radiology residents and practicing radiologists. Such tools are essential because of the increasing complexity and number of imaging modalities that radiologists are required to master.

John Parboosingh, MB, FRCSC, then reviewed activities of other medical specialties in medical education. As every medical specialty works to incorporate the six Accreditation Council for Graduate Medical Education (ACGME) competencies and the four MOC components identified by the American Board of Medical Specialties (ABMS), instruments for self-assessment of knowledge and clinical skills have become essential. In Canada, the Royal College of Physicians and Surgeons has created Web-based diaries in which physicians can track their “personal learning projects,” which are similar in nature and content to the physicists’ self-directed education projects discussed by Dr Hendee. Another strategy that is being employed is the development of “communities of learning” (groups of physicians with common interests, educational needs, and practices) who interact virtually to share resources, information, and insights.

Barbara E. Barnes, MD, MS, provided an overview of research in medical education. Systematic metaanalysis review of CME programs has found small to moderate effects of CME on physician education with a “mixed” long-term effect. The benefit is greater when the frequency of the desired behavior before CME is low. There have been few rigorous studies of CME, and those that have been conducted have focused on CME as an intervention rather than on what works for the learner. Research shows that physicians’ self-perceptions of their own knowledge levels and areas of competence tend toward the mean, with low performers overestimating their abilities and high performers underestimating their competence. Behavior change from CME is most likely to happen (*a*) when there is a moderate gap between knowledge and performance that is communicated to the individual, and (*b*) if the gap is in an area that is relevant to the individual’s own clinical practice. Intrinsic motivation for change can vary; formal commitment to do so can increase the likelihood that change will occur.

### Small Groups

Participants once again broke into small groups, with the groups being self-selected according to topic of interest. The purpose of these sessions was to discuss the implications of the previous lectures in small work group discussions. The areas addressed included MOC, education research, CME and CPD, and self-assessment and assessment by others.

**Maintenance of Certification.**—Participants expressed a desire to have the MOC process be meaningful and to promote the individualized process of lifelong learning. Because the MOC process is still fairly new, the majority of the discussion was spent on simple information exchange about the goals and mechanics of MOC. Participants stressed the need to inform, reassure, and engage members of their respective societies in the MOC process.

**Education Research.**—Participants in this group were, for the most part, experienced researchers, who differed in approach and philosophy. They stressed the need to train researchers in the methodology of educational research. The group spent most of its time identifying worthy research questions in need of study, including those that follow.

1. Does education result in better health care? Is there a way to measure this?
2. What is the best way to introduce new knowledge or train in new competencies?

3. How does competence or practice change over time?
4. What are the practice patterns over time?
5. What is the impact of MOC on quality of care?
6. How should you choose measures of quality, and how can you assess their validity?
7. How can one best measure interpretive skills?
8. What is the impact of the standardized board examination?
9. How can you measure procedural skills more easily?

**CME and CPD.**—The participants discussed a range of points (covering a variety of different CME formats), including those that follow.

1. There should be increased investment in developing high-quality Web-based CME programs, including education tools for residents.
2. Point-of-service tools are urgently needed to facilitate the immediate application of learning to practice.
3. There is still a place for didactic lectures, but they should become progressively more interactive as the learners' growth and comfort with the material increase.
4. Personal learning projects, while compelling, may be impractical because of the need for documentation. An easy tool that will assist physicians in recording such projects will increase the likelihood of physician participation.
5. As a leader in education, RSNA should invest in simulation-based learning.
6. Web-based curriculum in physics is needed.
7. A high-quality teaching file with good graphics and visual aids should be developed and maintained.

**Self-assessment and Assessment by Others.**—Participants noted that no learning programs would work well if practitioners do not see them as useful and necessary. The group felt that practitioners must be engaged in the MOC process as soon as possible. Motivating practitioners to participate might be difficult at first, but if practitioners do not drive the MOC process, then external forces will. Physicians could find their learning requirements dictated by licensing bodies, insurance providers, and the effects of public pressure.

Professional societies and accrediting bodies were urged to take the lead in the development of prepackaged practice assessment tools, with clear input from practitioners. A model similar to the popular "360-degree tool" (ie, a process in which supervisors, peers, and supervisees rate the job performance of an individual) was suggested as a

good starting point. Radiologists often work in isolation from other physicians and can have little notion of how their work is perceived by other professionals. External feedback would be a good means of assessing one's practice.

## Wrap-Up

The participants reconvened after lunch. After reviewing the findings of their deliberations, the participants spent some time as a group reviewing the implications of the conference. They discussed the measures that radiology societies and the RSNA in particular might take to begin to implement these suggestions and insights. Recommendations clustered into the following five major areas.

1. *Enhance Web-based educational materials.* There was strong and consistent support for point-of-care content that was readily searchable. Other desired resources included a well-indexed teaching file with decision support; case-based online self-assessment modules and education programs; customizable education portfolios linked to individual learning plans; and live, interactive online courses.

2. *Develop resources to improve radiologic education.* Participants agreed that radiology as a discipline needs to (a) broaden residency training programs to incorporate training on how to be a good educator, (b) train medical education researchers, (c) provide residents with training in research and leadership skills, and (d) develop a curriculum devoted to professionalism and other "nongognitive competencies."

3. *Capitalize on simulation in radiology education.* Exploration of applications of medical simulation to residency training and CME was suggested.

4. *Train radiologists to engage in practice-based continuous quality improvement.* Recommended actions included educating radiologists on how to design, implement, and evaluate continuous quality improvement (CQI) programs within their radiologic practices and teaching them about quality and patient safety in radiology.

5. *Explore communities of learners.* Recommendations included testing models for creating virtual networks of radiologists with similar practices, interests, and learning needs who can share resources and seeking out educational opportunities particularly appropriate to them.

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