VOLUME 16, 2003

NUMBER 3

Chairman's Editorial: Reprioritizing Radiologist Education: Teaching Old Dogs New Tricks

ONE OF THE FIRST LESSONS we learn in school is how to assimilate, process, and analyze information. During childhood, school and homework assignments are given to us directly by our teachers, providing us with straightforward, predictable means of gauging the quality and quantity of our knowledge. If we fail to turn in a homework assignment, we receive a punishment. If we perform poorly on a test, we are given a poor letter grade that reflects the failure of our work. During these years, when performance and success are clearly defined for us, students who are goal oriented often thrive, because in this "cause-and-effect" learning environment, rewards are relatively easy to come by.

As we get older and enter into higher learning, education (and testing) becomes less predictable. Teaching methods and the means by which grades are assigned often become less objective, and less structured. Students are expected to become independent in their learning and as a result are given less feedback on individual progress. A college grade will often be determined on the basis of a single paper or exam, and this presents new challenges for the student. The natural temptation in such a nonstructured environment is to postpone independent study until the last possible minute, immediately before the crisis moment (i.e., final test or paper due date) is upon us. A few select individuals can succeed in this environment of procrastination, but most of us cannot. We learn quickly that academic success often

equates with methodical work and good study habits. If we are to be successful, we must remain disciplined and vigilant in our quest for knowledge.

As we enter into our professional lives, a funny thing happens. Formal grades are removed and performance assessment often becomes subjective and idiosyncratic. In the beginning of our professional careers, many of us maintain our studious dispositions and continue to follow educational pursuits. We regularly attend seminars, read scientific journals, and participate in professional conferences. Over time, without the reinforcement of a test or performance grade, we begin to slip into a lull of self-confidence. The journals remain encased in their plastic wrappers, the seminars are replaced with family vacations, and professional conferences are transformed into shopping extravaganzas. The conversion from active to passive student is insidious and often occurs on an unconscious level; we don't intend to ignore our educational needs, we simply fill our agendas with "more important" tasks.

As this "educational vacuum" is forming in our professional lives, our priorities regarding job performance begin to shift. As resident radiologists we are often judged by our peers on the basis of our intellectual and problem-solving skills. We hold in high regard the man or woman who possesses a vast array of knowledge about the medical imaging literature. Basic scientific and clinical research is strongly encouraged and rewarded, with the promises of

free trips to scientific meetings. Even arcane subjects, like medical physics are held in high regard. In the end, knowledge is power, or so we think.

The overwhelming majority of radiologists leave these academic bastions to venture into the somewhat contradictory world of private practice radiology. In this world, knowledge is still revered, but to a lesser degree. Job performance is often based on productivity measures, in the form of RVU's or charges. No one ever says that quality is secondary to quantity, but the emphasis on throughput and economics certainly conveys that impression. In the end, we must all (on an individual basis), decide where our priorities lie. There is no single right or wrong answer. We learn quickly, however, that time spent pursuing academic pursuits is "lost" time. We can't generate additional revenue for the radiology practice by reading a journal, performing clinical research, or writing a paper. Simply put, time is money.

This emphasis on radiologist productivity has taken on greater significance in the existing practice environment because we are now faced with a radiologist supply/demand imbalance.^{1,2} All radiology practices must address this radiologist shortfall, but academic practices are disproportionately affected.³ Ironically the shortage of qualified radiologists has forced many academic radiology practices to abandon traditional academic pursuits and instead focus on workflow and productivity. In the end, these academic practitioners find themselves forced to practice radiology in much the same way as their private practice colleagues. Time traditionally allocated for educational and research pursuits is minimized, as the primary departmental focus shifts toward revenue. This situation confronts many radiologists with the conundrum of "quality or quantity." Are these goals mutually exclusive, or can we find creative means to accomplish both simultaneously?

To answer this extremely complex and controversial question, we need to explore the current (and future) state of imaging technology. Radiology is unique, for it is the only medical subspecialty that is entirely dependent on technology for its survival. Therefore, if we are to successfully address these important is-

sues of radiologist productivity, workflow optimization, and imaging economics, we need to remember that strategic planning requires a complete and thorough understanding of imaging technologies. At the same time, we must keep in mind the synergy that exists between imaging technology, research, and clinical applications.⁴ If the radiology community wants to dictate the clinical applications (and the associated economic reimbursements) inherent in these new technologies, they need to maintain a proactive role in research and education. A relevant example can be made with cardiac imaging, which was once the domain of the radiologist and is now firmly under the control of the cardiologist.

For us to explore the state of imaging technology, we need to re-think our traditional focus on individual imaging modalities and instead focus on the "global digitization" of radiology. The field has in effect been transformed from a modality-specific, centralized, analog environment to an enterprise-wide, digital environment. Hard-copy static images are no longer under the control of the radiology department. Instead, large and complex image data files are instantaneously accessible to all practitioners, independent of location and occupation. Radiologists must therefore find new and innovative ways to provide "added value" to the interpretation/communication process of these medical imaging studies, or risk becoming marginalized within the medical community.

The global digitization occurs at multiple layers within the imaging practice, from the acquisition device (which includes digital radiography and mammography), to the electronic report (which incorporates speech recognition and structured reporting). Between these endpoints lie a number of important issues that cannot be ignored, including electronic storage and distribution (which may incorporate image compression and/or dynamic transfer syntax), image processing (which may include segmentation and textural analysis), image display (which includes 2D and 3D multi-planar reconstruction), and image interpretation (which incorporates decision support tools such as computer-aided detection). If radiologists sit idly by and allow these applications to be de-

terminated by information technology professionals, vendors, or clinicians they risk becoming outliers to the process and potentially losing valuable turf within the political and economic framework of the institution.

While this scenario might appear hypothetical to some readers, we can easily relate it to an existing crisis within the current practice environment, in the form of multi-slice computed tomography (CT). Over the past decade alone CT has undergone its own evolution, from single slice, to helical single-channel, to helical multi-channel (16 and counting). The typical abdominal/pelvic CT exam has gone from approximately 80 to 1,000 images during this transformation. This exponential increase in image number has effectively eliminated film as a practical form of image display and, ironically, has served as the impetus for many film-based institutions to make the transition to filmless operation. Radiologists in turn have realized that traditional means of image display are impractical and have begun to employ new display/interpretation strategies for these large complex data sets. This shift has resulted in an evolution in CT interpretation, with seven steps identified in the transition from hard-copy film to 4D volumetric navigation with computerized decision support.⁵

Understanding these new computerized applications is imperative for all radiologists, regardless of the size, location, and type of our radiology practice. We must develop effective coping strategies to address the evolving imaging practice requirements. Optimizing the man-machine interface will become critical if we are to maintain an optimal balance between interpretation accuracy and productivity. Computer applications hold the key to our future clinical success, and they have economic implications as well. As digital imaging files become the norm, patients will have the ability of "self-determination," effectively selecting the interpreting radiologist. Those of us who fail to adapt to these changing expectations and practice patterns risk becoming clinically and economically marginalized.

If we agree that radiology is undergoing fundamental change in the face of these new computer-based applications, then what is the optimum plan for survival? How can we bal-

ance competing demands for improved interpretation accuracy and productivity? How can those of us who are far removed from training programs quickly and efficiently be brought "up to speed"? How can radiologists in training better prepare themselves for this digital revolution, when no formal training is being offered in their residency programs?

The answer (in my humble opinion) is to return to our youth, when education was viewed as fundamental to success. We must fight the impulse to remain in our existing "educational vacuums," and become proactive in our learning if we are to navigate this digital minefield. Educational pursuits should remain focused, goal-oriented, and, most important, fun. That has been our mission in creating SCAR University, which seeks to educate a variety of imaging professionals with vastly different levels of experience, expertise, and expectations. Our approach has been to compartmentalize educational programs on a topical and experiential basis. For those who want to learn everything about a specific topic (e.g., Digital Radiography), a variety of educational programs are available, with different levels of complexity. For those wishing to learn the basics, a large number of introductory courses are available, across a wide continuum of subjects. Realizing that education is not a "9-to-5" pursuit, we are developing educational programs that go beyond the SCAR annual program and that can be accessed both on-line (<http://www.scarnet.org>) and through print publications (SCAR primer series, "Life in the Digital Enterprise").

One of SCAR's highest priorities at this time is the development of an educational program specifically targeting the private practice radiologist community. As experts in the digital imaging domain, we feel uniquely qualified to serve as educators, to help the private practice radiologist community address these challenges. Our goal is not to dictate, but to facilitate the educational process. In the near future, we will be seeking input from the private practice radiologist community and look forward to your suggestions and active involvement. In the words of the great philosopher Woody Allen, "80% of success is showing up." We look forward to seeing you soon.

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Online publication 18 December 2003

doi: 10.1007/s10278-003-2500-y