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Introduction: Researching the Impact of Information Technologies on Radiology Technologists: "Taking It to the Streets"

FOR THOSE OF US who practice as private practice radiologists, research is not a high priority and often is viewed in a negative light. I often joke with my colleagues about "the dirty *R* word," which I secretly hold in high esteem. The reason my opinion deviates from that of many of my private practice colleagues is that I believe that medical imaging research is the key to our long-term success. The value of this research is particularly relevant to radiology as we make the transition from traditional film-based to filmless departments. A case can be made that our value, as radiologists, may become marginalized after clinicians gain direct access to medical images on a digital archive. Physicians are no longer required to "waste time" in the imaging department because they can review images and reports in the comfort of their offices. Unless these clinicians perceive that radiologists have something special and unique to offer regarding patient management and clinical decision making, they simply will eliminate us from their daily rounds. This observation was validated in studies^{1,2} that we published based on our experience at the Baltimore Veterans Affairs (VA) Medical Center.

In a 1998 editorial, Peter Ogle, editor of *Diagnostic Imaging*, underscored the intimate synergy that exists between technology and research within radiology. "Whoever controls the research controls the technology. And whoever controls the technology can dictate its clinical application." This perspective has often been ignored within the radiology community, as

other medical specialties seize control of imaging research opportunities and, in turn, take control of the technology and its clinical applications. A relevant example can be seen in cardiac imaging, which was once the domain of the radiologist and now is squarely under the control of the cardiologist. As new imaging frontiers present themselves to the medical imaging community, will we (as radiologists) become more assertive in our research efforts and maintain technologic control?

Research traditionally has been the province of academicians, who are motivated to move up the academic career ladder by producing publications and securing grants. For the majority of practitioners who work outside of the academic domain, research is viewed with skepticism. I often overhear conversations among private practice colleagues who lament the preaching of the "ivory tower" university radiologists. It seems as though radiology is practiced in two worlds, academia and nonacademic, community-based private practice. Traditionally, private practice radiologists have looked to the academic ranks to guide them in practice patterns and to establish standards of care. It appears, however, that a growing division separates these diverse communities. What common ground will allow these disparate groups to work collectively? Simply put, the common bond is research.

All medical imaging professionals are faced with the paradigm shift from film to filmless practice, and anxiety and uncertainty appear to be in abundant supply. Reimbursements continue to be cut, and all practitioners are asked

to do more with less. These challenges are not the exclusive domain of radiologists, technologists, clerical staff, and administrators are also affected. The net effect is that morale is declining as more and more health care professionals opt for career change and early retirement. This is readily apparent in the job marketplace, which now has historic levels of vacancies for radiologists and technologists. Analysts have suggested that this situation is likely to worsen in the near future.³ Administrators and department chiefs are being asked to do more with less. Frequently, the tendered explanation is technology related, with a myriad of numbers bantered about by vendors who extol the virtues of information systems and picture archiving and communication systems (PACS) as cures for imaging departments' productivity woes. When one takes the time to explore the published medical literature, there is little data to support these claims. At the same time, the published data are somewhat contradictory.

One of the frequent comments we receive when presenting data from the Baltimore VA Medical Center is that these data are somewhat idiosyncratic in nature. Productivity and utilization data at one facility do not necessarily translate into comparable data at another facility. VA hospitals have unique patient populations and staff, a unique reimbursement system, and proprietary information system technology, which make them different from community-based hospitals (which constitute more than 80% of hospitals in the United States). This observation was echoed in a reviewer's comments suggesting that one of our reports should be classified as a case report instead of a scientific paper, because it was the experience of only one facility. My colleagues and I wholeheartedly agree and have encouraged other facilities to collect data and publish their experiences. This would give the medical literature a broader base of data, that would encompass the complete spectrum of practice in the imaging community. Unfortunately, the reality is that few institutions are doing this, largely because most practitioners do not have the time, energy, or personnel to support such an effort.

With these limitations in the available database, how does one go about strategic planning

and implementation for filmless transition? If a department administrator is asked to create an operational budget as PACS is implemented, what assumptions are realistic? Will personnel costs truly decrease as filmless operation is implemented and what (if any) productivity gains can be expected? Is there a learning curve phenomenon? Are these productivity changes unique for different vendors' equipment? How should the demographic profile of the institution affect these issues? How does integration between different technologies affect productivity and workflow?

To answer these questions, the SCAR Research and Development (R&D) Committee made a commitment to facilitate research that affects practitioners of computer-based imaging and information technologies. The committee chose to emphasize practical research, that addresses questions posed frequently by the imaging community at large. One of the first projects sponsored by the R&D Committee is a longitudinal nationwide survey that looks at the complex relationship between information systems and PACS and technologist productivity and workflow. As prospective data are collected over a continuum of demographic and profile groups, we will attempt to control for confounding variables and make data-driven projections that will allow predictions based on an individual facility's demographic and technology profile. At the same time, the longitudinal nature of this survey will allow us to collect data within institutions as they undergo incremental changes in technology implementation. The aggregate surveys published to date have largely provided single snapshots in time. We hope our longitudinal study will function more like a camcorder, capturing multiple data points over an extended time. This approach should provide us with a better understanding of the complex interactions that occur between and within institutions as they make the transition to filmless operation.

Our three-part series in this issue of *The Journal of Digital Imaging* presents the initial results of this ongoing survey. It is the hope of the authors that this will shed light on the very complex interplay between implementation and integration of PACS and other

information systems and technologist staffing, productivity, and workflow. We realize that “the jury is still out” and hope to continue this effort well into the future. We look forward to your active participation and feedback.

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