

Virtual Mentor
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FROM THE EDITOR

Taking Full Measure of Today's Radiologist

The extraordinary growth of imaging technology has dramatically affected all aspects of the practice of clinical medicine. As imaging comes to play a larger role in patient care, it is critical to consider the role and professional obligations of the physician-specialists who work in and lead this expanding field—radiologists. Are radiologists responsible for insuring that patients receive the optimal exam for a particular indication with minimal risk and cost? Do radiologists' obligations to referring physicians extend beyond clear and timely communication of results? Do radiologists have duties directly to patients? In short, what does it mean to be a radiologist?

This issue of *Virtual Mentor* directly tackles these and other questions that contemporary diagnostic radiologists face. The first clinical case discusses the role of radiologists in the era of telemedicine: can radiologists in a different state or country be as effective as those who practice in the same community as the patient? The second clinical case raises one of the field's most frequently encountered ethical concerns—the discovery of a missed lesion. The commentary describes the guidelines for determining whether not reporting the lesion was in fact an error and if so, whether it must be disclosed. The third clinical case examines an essential aspect of the practice of radiology—cooperation with the referring physician—that can be a source of professional and ethical tension. In the medical education article, a former residency program director describes the challenges to residency training posed by recent developments in radiology and the growing interest in the field among medical students. Since new imaging modalities have not displaced the standard X-ray for static views of the skeleton and dense tissue, the journal discussion addresses a perennial question: has the accuracy of X-ray interpretation improved over the decades? The clinical pearl introduces one of the newer technologies in cancer diagnosis—breast magnetic resonance imaging.

The issue then moves from the bedside to a broader view of diagnostic radiology, with a policy forum that examines the effect that the 1992 Mammography Quality Standards Act (MQSA) has had on mammography and women's access to that form of screening. The success of this federal legislation remains an open question. The health law section reviews two other federal statutes—the Medicare and Medicaid Antikickback Act and the Stark Law—both designed to prevent physicians from profiting by referring patients for unwarranted services. In the medicine and society section, the author addresses the diagnostic radiologist's professional obligations to his or her patients, colleagues, the community, and society. And finally, the author of

the medical narrative article describes one of the masterpieces of Western literature—Thomas Mann’s *Magic Mountain*—as a fictional example of the power of images, the truth that seeing is believing.

By considering these topics and scenarios carefully, we may be better able to recognize and confront the ethical—and not just the clinical—challenges faced in our daily practice as we develop into morally conscious physicians and physicians-in-training.

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CLINICAL CASE

Outsourcing: A Limited View of Radiology's Role

Commentary by Richard Gunderman, MD, PhD, MPH

As part of a private practice radiology group in a small town, Dr. Adams had been reading the imaging studies from a local community hospital, Holmes Medical Center, for 15 years. A native of the town, Dr. Adams grew up learning about his community and embraced its culture. He lived in the same neighborhood as many of his patients and often saw them at the local coffee shop and diner. Through these informal interactions, Dr. Adams was able to observe the changing health of his patients over a period of years. He has also been an active member of the local medical community, meeting face-to-face with the referring physicians from the medical center weekly.

At a meeting with Holmes' administrators Dr. Adams heard for the first time about a proposed cost-cutting initiative. The hospital was considering whether to send imaging studies to specialists at a large academic medical center in a different state. The larger center had more radiologists and performed the services for less than Dr. Adams' group charged. After Dr. Adams described the disadvantages of the proposed initiative, a hospital administrator said, "Without the large source of images from us, your small group probably won't be able to support a practice anymore. I think your arguments are motivated primarily by concerns about your financial well-being."

Commentary

At stake in this case are competing visions of radiologists and their role in the care of patients. On one side is the view that radiologists are basically interpreters of images, who, in this era of electronic imaging and report transmission, can perform as well from another state (or even another country) as from the local hospital. On the other side is the view that radiologists have responsibilities that extend beyond image interpretation and include relationship building with patients, referring physicians, and the communities they serve.

The out-of-state academic practice may offer greater value than the local radiologists in several areas. If it is a large group, it may be able to deliver more specialized diagnostic expertise in areas such as neurological, musculoskeletal, and pediatric imaging than a small community practice. Again, because of its size, the larger practice may be able to offer superior after-hours service by providing interpretations within minutes of exam completion, a standard that is difficult for small community groups to match. Finally, an academic practice may confer extra prestige on the

hospital, which can claim that its radiology services are provided by a nationally recognized faculty.

On the other hand, the local radiology group may offer advantages of its own. The local radiologist and his colleagues are likely to be better known to the patients and referring physicians, as well as to the community at large. In medicine, where trust is paramount, actually knowing the person to whom you are entrusting your life (or your patient's life) can be crucial. Moreover, local radiologists may be in a better position to improve working relationships between radiology and other departments and to ensure that imaging services best meet the needs of those who depend on them. Community radiologists are also able to serve more effectively as patient advocates because they understand the local health care environment.

The out-of-state academic practice claims that it can provide radiology services at a lower cost than the community group. At the very least, such a claim deserves careful scrutiny. Will the out-of-state services be comprehensive, including reading of fluoroscopic exams performed at the hospital by on-site radiologists, or will they handle only exams that do not require the physical presence of a radiologist, such as CT and MRI? It is worth noting that the reimbursement levels for CT and MRI are generally considerably higher than those for fluoroscopic exams.

More Than an Image Interpreter

Underlying all these practical issues is a still deeper question. What does it mean to be a radiologist? Is a radiologist analogous to a piece worker on an assembly line, taking in images and churning out diagnoses? Or is the radiologist a full-fledged physician, no less responsible to patients and professional colleagues than physicians in any other medical specialty? Do radiologists' responsibilities end at ensuring that no findings are missed or misinterpreted, or is the radiologist also responsible for ensuring that the specialty makes the optimal contribution to patient care with minimal risk and cost? Are radiologists highly skilled technicians or true consultant physicians?

The long-term health of the field requires that radiologists cease to think of themselves strictly as image interpreters and recognize that they have a vital role to play in building relationships. Radiologists should be at the forefront of efforts to educate health professionals about the appropriateness of alternative imaging examinations in different diagnostic contexts and must offer strategies for reducing unnecessary risks and costs. Likewise, radiologists should help educate patients and communities about the role imaging plays in their care. On-site radiologists are far more likely to fulfill such responsibilities effectively than radiologists operating from another state.

Community Considerations

Before a decision on outsourcing is made, stakeholders should also consider how often the members of an out-of-state teleradiology group will participate in the hospital's grand rounds program? How often will they join actively in the

professional life of the hospital, through service on committees and elected offices? What types of relationships will these out-of-state physicians forge with those working directly with the patients? What will they contribute to the local community, not only in terms of monetary donations to worthy causes but also as volunteers through the hospital and local civic, religious, and educational organizations? Participation on local committees and in community events is one of the responsibilities and privileges of being a physician, and replacing local medicine with outsourced services is likely to undermine these pursuits.

Radiologists who think that they speak directly only to voice recognition software and who see every request for consultation as an interruption should not be surprised when their hospitals propose to replace them with nonlocal radiology services. If radiology is to remain a vital part of community health care, radiologists need to see themselves not only as image interpreters but also as relationship builders, whose on-site, face-to-face contributions to hospitals, referring physicians, patients, and communities are so substantial that it is difficult to imagine life without them.

Richard Gunderman, MD, PhD, MPH, is an associate professor of radiology, pediatrics, medical education, philosophy, liberal arts, and philanthropy at Indiana University. He teaches courses in the ethics of philanthropy and biomedical ethics, and his latest book, *We Make a Life by What We Give*, will be published by Indiana University Press in late 2007.

The people and events in this case are fictional. Resemblance to real events or to names of people, living or dead, is entirely coincidental.

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CLINICAL CASE 2

Disclosure and the Retrospectoscope

Commentary by Thomas H. Gallagher, MD, and R. James Brenner, MD

Mrs. Lee is a busy, working mother. She has raised three children, all of whom are successful attorneys, and was looking forward to retirement when she was diagnosed with breast cancer in her left breast. Her tests following surgery showed no cancer, and six months later Mrs. Lee went to a breast imaging center for a follow-up visit.

Dr. Harris reviewed old imaging studies in preparation for her meeting with Mrs. Lee. She looked at the mammogram that had been interpreted as normal by another radiologist, 18 months before Mrs. Lee was diagnosed with breast cancer. After careful examination, Dr. Harris noted a small, ill-defined density in the left breast. It was in the location where the cancer was diagnosed on the subsequent mammogram and, in retrospect, it most likely represented the cancer in an earlier stage. In her own mind, Dr. Harris believed that many radiologists, possibly even she herself, would have interpreted the mammogram as normal. She wondered whether to tell Mrs. Lee what she had seen.

Commentary

There has been increasing interest in disclosing unanticipated outcomes—especially those resulting from medical errors—to patients [1]. Most states have passed or are considering laws that grant some degree of legal immunity to physicians who inform patients about errors and apologize for them. The National Quality Forum recently added disclosure of unanticipated outcomes to its list of safe practices [2]. Many hospitals and health care organizations have adopted institutional policies that encourage disclosure, and some health care institutions and malpractice insurers that have adopted open disclosure policies have reported improvements in their litigation experience [3].

Yet a significant gap persists between these recommendations and current practice. Some studies suggest that as few as one-third of harmful errors are discussed with patients [4]. While physicians generally endorse the concept of disclosure, they are unsure what words to choose, hesitate to explicitly state that an error has occurred, seldom discuss how recurrences will be prevented, and worry that an apology may represent an admission of liability [5-8]. Barriers that contribute to this disparity between recommendations and practice include physicians' fear of malpractice, embarrassment over making harmful errors, and low confidence in their skills to communicate with patients about a mistake.

Error Disclosure in Mammography

This case highlights additional reasons why disclosure can be so difficult. Oncology presents an especially challenging set of issues due to the vulnerability of the cancer patient, the uncertainty and fear associated with cancer diagnoses, and the toxicity of the treatments [9]. Disclosures in cases of mammography error are even more complex. Failure to diagnose breast cancer is one of the most common and costly causes of malpractice litigation, and radiologists are the most frequently named defendants [10, 11]. In one recent survey, 35 percent of radiologists who interpret mammograms said they have considered leaving this area of image interpretation due to malpractice concerns [12].

This case is also challenging because it represents a potential error on the part of the radiologist who interpreted a previous film—not the doctor who is currently treating the patient. While standards are being developed to help doctors disclose their own errors, similar guidelines for discussing other doctors' errors with patients are lacking.

In the absence of formal guidance, Dr. Harris should consider a number of questions.

Was this an error? Physicians often underestimate the difficulty of determining whether an error occurred, and, if so, whether it harmed the patient. The assistance of patient safety analysts or expert physicians in the same specialty is often required to provide an unbiased answer to this important question. This case represents an example of a false-negative mammogram, that is, one read as normal in a patient who was subsequently diagnosed with breast cancer within a relatively short time. Determining whether a false-negative represents an actual error is difficult. In one retrospective look at the prior mammograms of patients diagnosed with breast cancer, about one-third of the films had no visible precursor lesions, one-third had precursor lesions that were visible but not worrisome in appearance, and one-third had malignant-appearing precursor lesions that were missed [13].

In the case at hand, Dr. Harris is unsure whether she would have interpreted the prior mammogram as normal. She might consider submitting the film to a legally protected peer review forum to determine whether the prior reading was an error. Finding a forum might be difficult if the initial interpretation was made by a physician at another institution (i.e., not a “peer” as defined by quality assurance protection statutes), or if Dr. Harris practices in a state, such as Kentucky, where the legal protection afforded to peer review forums has been reduced.

Did the error harm the patient? If Dr. Harris feels confident that the interpretation of the prior film represents an error, she should then consider whether it harmed Mrs. Lee. This is an especially tough question to answer in the case of false-negative mammograms and is independent of whether an error in diagnosis was made. More advanced cancers often require more complex and toxic treatments with lower chances for success than early-stage cancers. Cancer is treated at the stage in which it is diagnosed, however, and determining whether a given delay in diagnosis harmed the patient can be tricky. Even the definition of “harm” is fraught with ambiguity. For example, would the mere knowledge that her cancer diagnosis might have been delayed constitute a psychological harm to the patient whether or not the delay caused physiologic harm?

Will the physician who read the earlier film tell the patient what happened? If it is clear that a harmful error has occurred, it is desirable for the physician most closely associated with the event to tell the patient about it. Dr. Harris might contact the original radiologist with her concern and inquire whether he or she would be willing to discuss the event with her or with the patient directly. The original radiologist, however, may interpret such a call as an unwelcome contact from a competitor. Perhaps in the future, a neutral third party, such as a county medical society, could facilitate conversations between physicians about potential errors such as questionable film interpretations. Providing appropriate venues for physicians to discuss quality-

of-care concerns with one another presents a formidable challenge to the medical system and is the subject of considerable research and dialogue [14].

What are the goals of disclosure? In the event that (1) the prior reading was an error, that (2) caused the patient harm, and (3) the involved radiologist refuses to tell the patient of the harmful error directly, Dr. Harris should consider what her goals are for informing the patient of the mistake. There are two primary ethical rationales for disclosure, and, at times, they can point physicians in different directions. Some ethicists view error disclosure primarily as an element of informed consent that provides patients with information they need to make future medical decisions. Using this standard, the rationale for telling Mrs. Lee about a harmful error in her care would be to allow her to avoid future harm. Other ethicists emphasize that admitting to harmful medical errors honors physicians' professional obligation to be truthful to patients. Framing the ethical goal as truth-telling implies that physicians have a broader obligation to share harmful errors with patients in their care, regardless of how this information affects the patient's decision-making process.

Should I take the initiative to disclose an error or wait for the patient to ask questions? In cases where the ethical rationale for disclosing another doctor's error to a patient is strong, such as when informing a patient of a clear-cut error is necessary to avoid serious future harm, physicians have a positive ethical obligation to share this information with the patient regardless of whether the patient asks [15]. The ultimate ethical directive for the physician is to provide complete, truthful information to the patient.

Given the uncertainty regarding whether the prior mammographic interpretation represents an unequivocal error, it does not appear that the present case meets the high standard for obligatory disclosure. Particularly in mammography, which involves regular patient exams, it is natural for patients diagnosed with cancer to wonder whether a lesion was visible on the old film and whether the cancer could have been caught earlier. The temptation is high for physicians to speculate about the meaning of earlier films.

Physicians should be prepared to respond thoughtfully and carefully to these types of questions and should approach these conversations with extreme caution. It is not uncommon for malpractice suits to be precipitated by a physician's off-hand remarks as he or she tries to put the meaning of lesions seen on old films into a context that the patient can understand. If Dr. Harris believes she would have read the initial film as normal, she might respond to Mrs. Lee's query about whether the lesion was visible by recusing herself from that determination because she has already formed a diagnostic impression. She might indicate that often areas are seen in retrospect but that determination of whether it should have been acted upon at that time is best conducted by an independent party.

Summary

Patients have a right to truthful and accurate information about harmful errors in their care. Yet providing this information to patients can be fraught with complexity, especially when the event in question occurred at the hands of another physician. Physicians should use protected peer review mechanisms to determine whether a harmful error has occurred. The medical profession

should develop explicit standards for when disclosure of another physician's error to a patient is ethically and legally appropriate.

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R. James Brenner, MD, is a professor of radiology and chief of breast imaging at the University of California, San Francisco, and the immediate past president of the Society of Breast Imaging. Dr. Brenner is also the central reviewer for the Allergan MRI studies on silicone implant integrity.

Related in VM

“I’m Sorry” Laws and Medical Liability, April 2007

Learning Objective: Learn a set of criteria for deciding whether a false-negative mammogram reading constitutes a medical error and under what circumstances the patient must be informed of it.

Keywords: medical error, disclosing harmful errors, mammography, breast cancer, breast lesions, peer review forum, mammography interpretation, false-negative mammograms

Description: A discussion of how and when to tell patients that another physician erred while they were under that physician’s care.

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CLINICAL CASE 3

Suspected Child Abuse

Wilbur Smith, MD

Jimmy, a 2-year-old toddler, was taken by his mother to his pediatrician, Dr. Wagner, because he had been holding his wrist and crying that it “hurt real bad.” Dr. Wagner had been the family’s pediatrician for the past year and was just getting to know them. Jimmy’s father sat on the board of directors for the hospital, so Dr. Wagner always went the “extra mile” to provide the best care and tried to portray the Department of Pediatrics in the best light.

When Dr. Lawrence, the pediatric radiologist at the same hospital, analyzed Jimmy’s X-ray, she noticed signs of two healed fractures in addition to the new fracture. The child’s bones otherwise appeared normal.

Dr. Lawrence called Dr. Wagner to discuss what she had found and mentioned abuse as a possible cause for the fractures. Dr. Wagner made light of the situation, saying that it would not be appropriate to make such an accusation of a member of the hospital’s board of directors.

Dr. Lawrence was frustrated. If the pediatrician wasn’t going to follow up on suspected abuse, what steps should she take?

Commentary

The case presents a dilemma that many pediatric or general radiologists face—to whom do they owe their allegiance? Is the radiologist’s professional obligation to the ordering physician, the parents of the minor child, the child, or to a third party, such as the state? When does suspicion of child abuse demand that a radiologist go beyond the usual specialist-primary care relationship to the point at which an outside investigation is sought and social services or law enforcement intervention may result? What happens to the radiologist’s referrals and her professional reputation if she bypasses the child’s physician and reports the case for investigation and her suspicion is correct? What happens if she reports and her suspicion is groundless? These are all difficult, real life questions that need to be examined from societal, medical, ethical, and legal perspectives.

Child abuse and neglect are national health problems that affect thousands of children every year. Of at least one million reports filed annually with various protective services, approximately 330,000 are, upon investigation, judged likely to be child abuse [1]. About half of the abuse cases are physical, and the other half are

neglect, making the incidence of proven abuse about 150,000 cases per year. And about one-third of those—50,000—are sexual abuse [2]. The preponderance of physical abuse occurs in children younger than 4 years of age, a population which numbers roughly 10 million children in the United States. In this age group the estimated rate of physical abuse approaches 1 child per 100—a proportion that far exceeds that of many serious childhood diseases. The gross mortality from abusive injury is not easily established, inasmuch as many cases are not recognized; however, most estimates put it at about 2.8 per 100,000 U.S. children per year, underscoring the importance of physicians' noticing disturbing trends or signs, questioning parents and young patients about home life, and, if necessary, reporting suspicions to authorities [3]. The morbidity, both psychological and physical, far exceeds the mortality in prevalence, and almost every abused child probably suffers some degree of morbidity.

Despite the physical and mental dangers of child abuse, a false-positive report is not without cost to the child and family. Both the radiologist and the pediatrician must realize that, if they disclose their suspicions to social service agencies, the family will be investigated and, in the majority of cases, no further action will be deemed necessary. But even if the suspicion is determined to have been groundless, the investigation will disrupt the family's standing in the community, will probably erode the patient-doctor relationship, and can have a detrimental impact on spousal trust within the family. Once the report is made, the situation is out of the doctor's control, so the decision to report is not a trivial one.

Legal Considerations

From a legal standpoint the responsibilities of the radiologist are clear. As a licensed provider of health care, a physician is obligated to report suspected child abuse. Dr. Lawrence, in this case, does not fulfill this obligation by making her concerns known to the referring physician; she has an implicit duty to the patient—in this case the child—just as she would be expected to accurately diagnose and report any other suspected serious condition, such as a cancer. The usual medical path for reporting child abuse is through the pediatrician. If the pediatrician disagrees, and the radiologist is still uneasy, as a mandatory reporter, he or she is obligated to report the case to the local child protection investigation agency. This move is not without risk to the radiologist, inasmuch as her actions might disrupt her practice, hurt her relationship with her referring physicians, and imperil her standing with the hospital. Nevertheless, the legal obligation to report is clear.

All states have shield laws protecting a “good faith” mandatory reporter from civil or criminal liability for reporting child abuse. These laws were enacted owing to a national recognition that the harm caused by a good-faith, mistaken report was far less than the potential damage or death of a defenseless child-victim. Many states also have provision in their reporting laws that include potential for sanctions ranging from adverse licensure actions to misdemeanor criminal penalties when a mandatory reporter knowingly fails to report. While the justice system has generally been loath to prosecute mandatory reporters for failure to fulfill that duty, there are

some examples where civil liability has been assessed or alleged for failure to report child abuse [4].

The Radiologist's Duty to Inform

Judging whether any particular case is an instance of abuse is difficult for the radiologist, since she is not the patient's primary (or direct) care physician and therefore may not be privy to parts of the patient's medical information that could influence her opinion on suspected abuse. Consider an analogy: a radiologist sees an unexpected malignant tumor on a CT scan of the chest and notifies the referring physician, who refuses to believe the finding. What is the radiologist's responsibility to the patient? The communication guidelines of the American College of Radiology state that, when the referring physician cannot reasonably be notified of a serious life-threatening condition, the radiologist must communicate directly to the patient, or in this case the caretaker of the minor child [5].

The meaning of the guideline is clear; the radiologist's responsibility to the patient goes beyond issuing an image or scanning report. Rather, he or she must reasonably ensure that the patient or responsible caretaker is aware of adverse findings. In the example of the tumor, many radiologists would stop at the point of documenting the discussion with the referring physician and making certain that the patient's primary physician understood the implications of the diagnosis. A minority would bypass the referring physician and directly inform the patient if they had a high suspicion of malignancy with which the referring physician disagreed. If there were evidence that the referring physician was somehow incompetent or completely misguided, the radiologist would most likely go directly to the patient. Following that argument, since (1) the referring physician disagrees with the radiologist but offers no compelling evidence to dispel the radiologist's suspicions, (2) the radiologist has no access to the patient's records, (3) in the eyes of the law the child is incompetent to care for himself, and (4) the law requires direct reporting, the radiologist must comply with the law.

A physician is given great power by society, and with that power comes great responsibility. The protection of a defenseless victim is the responsibility of the physician-caretaker even if it involves the risk of alienation from colleagues, loss of professional opportunities, or personal discomfort. Physicians are duty-bound to protect their patients and that principle, to care for those in need, must be the beacon in this case. The radiologist must independently report the case and protect the child.

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Wilbur Smith, MD, is the chair of diagnostic radiology, vice chair of academics, and director of the radiology residency program, all at Wayne State University School of Medicine in Detroit.

The people and events in this case are fictional. Resemblance to real events or to names of people, living or dead, is entirely coincidental.

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MEDICAL EDUCATION

Radiology Residency: Home Away from Home

Sami H. Erbay, MD

These are good times for radiology residencies across the country. Highly motivated, enthusiastic medical students are selecting radiology residencies in record numbers, and the trend is likely to continue for some time.

Among the key reasons for this increased interest and radiology's desirability are expansion of the field through a constant stream of new diagnostic and treatment techniques and molecular imaging developments and its integration of nonmedical sciences such as statistics and physics.

As the field expands with increasing speed, residency programs are challenged to train new doctors in both its fundamentals and frontier technology. I have always thought that there are two avenues of teaching in any residency. The first is the formal, school-based approach that encompasses didactic lectures, courses, grand rounds, hospital-based training, and board exams. The second avenue is apprenticeship: students observing the expert to acquire and advance their mastery of a given task. These two learning approaches go hand in hand. Residents must read scholarly papers and medical textbooks regularly, but it takes the masters (teaching faculty and fellows) to bring the material that residents study to life by challenging them, highlighting weak points in their knowledge, and stimulating them with topic-specific cases and hypothetical situations.

The Formal Curriculum

Beyond the advances specific to radiology, subject areas such as statistics, physics, ethics, research, and radiology-pathology must be worked into the expanded curriculum as well as time for morbidity-mortality conferences. Given the changes in radiology and the complementary topics that today's residents must master, how can we achieve a more inclusive, progressive, up-to-date curriculum? The solutions will come at individual residency, regional, and national levels. National accreditation (ACGME) and supporting organizations (American Board of Radiology, Associations of Program Directors in Radiology) recognize the need for developing standard training in radiology and are developing competencies that the curricula in all programs must address.

Complementary sessions and training in these new competencies can be organized at the city or regional level to enhance educational exchange and to share resources for a more extensive educational network. For radiology residents in the greater Boston

area, for example, regional educational seminars known as the New England Roentgen Ray Society Meetings are offered once a month during the winter. These lectures and pertinent case discussions have always been well received by the residents. Institutions with more than one residency program can arrange institution-wide, non-specialty-based seminars and programs for all trainees in topic areas such as statistics, medicolegal issues, ethics, and harassment policies, for example. Such collaborations have the obvious advantage of reducing the cost of the offering to each residency department.

As more hospitals hire fellowship-trained radiologists, we can expect material related to evolving subspecialties such as neurological, musculoskeletal, and cardiovascular radiology to be well represented. At the same time, attending physicians who are passionate about the less-popular topics like statistics, research, or ethics, are needed; these subjects are pertinent to every doctor, every year. And the physicians who teach them are true educational companions for the residency directors, enhancing the value of the program through their commitment and dedication to new physicians. Attending physicians understand the large knowledge base residents must acquire and the long hours, stressful calls, and personality conflicts they go through. Their experience and mentoring is especially meaningful to junior residents, whom they often help through personal situations. Remember that these residents are, for the most part, young doctors, many of them choosing to start families along with their new careers. Programs are competing for attention with these life-changing events and attempting to inspire the trainees about radiology.

Apprenticeship and Values

The opportunities for the apprenticeship approach to complement the formal curriculum are obvious. Interestingly, apprenticeship learning appears to have evolved on its own without much opposition. Take the example of ethics. The study and application of ethics prepares us to be thoughtful, respectful, dignified people who can work well with others. For doctors, it means internalizing the professional principles of putting our patients' well-being ahead of all else, of respecting their privacy and their rights, and steadfastly maintaining their confidentiality.

Most people acquire a basic sense of right and wrong, respect for others, and the importance of sharing in their homes during childhood. These concepts are reinforced throughout one's schooling, and other dimensions of ethical conduct—timeliness, duty, helpfulness, and being a team player—are added along the way. Residency programs can be viewed as family nests that nurture values. Still, most people arrive at the residency nest well after they have acquired and developed personal values, and further molding or relearning may not be an easy task. Couple this with the fact that today's ethics training includes many ideas about cultural diversity and tolerance of difference—understanding of harassment and sexual orientation for example—about which this generation of residents may have formed strong opinions. While a gentle tap of "hello" on someone's shoulder may be considered a routine way of welcoming in some cultures, for others this behavior may fall into the sexual harassment category. While some cultural sensitivity

information can be delivered in the classroom setting, by and large it has to be seen and lived to be understood. The trainees must be open to new values being added and old values being refined in this new family nest. The masters must be patient but attentive to their pupils and willing to engage them.

The 360-Degree Apprenticeship

Residents are the window of connection to the outside world; new ones coming every year are refreshments. Many trainees arrive with extraordinary human qualities. These unique people are gifts in the basic sense. They not only serve as role models for their classmates, but they influence and remodel the masters themselves. It is quite all right, therefore, for us—the teachers—to be open-minded and welcome these people and consider their suggestions.

While taking notes during an interview, I always asked the residency applicants to give me three of their most important character traits. Among the various traits they mentioned, one would grab my attention more than any other: team player. I would highlight and put this in capital letters when the applicant mentioned it. There will always be emergencies, family-related unexpected events interrupting people's lives. Residents are not exempt from these. There is nothing more valuable to the program director than getting a volunteer to cover an unexpected absence without questioning the situation. For me that volunteer is the true team player.

Solutions to creating a balance between formal training and apprenticeship in any residency will also come from the norms and the location of the individual program, its support structure, and, more importantly, how openly the members of the department and the residency staff discuss these matters with each other. To succeed, a program must enjoy maximum participation and dedication from everybody involved. It can be defined simply as a team sport.

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JOURNAL DISCUSSION

Why Has Evidence of Error-Filled Diagnostic Medicine Not Led to Changes Within the Profession?

Rebecca Shore

Berlin L. Accuracy of diagnostic procedures: has it improved over the past five decades? *AJR Am J Roentgenol.* 2007;188(5):1173-1178.

Research continues to indicate that medical practice is beset with a high rate of error and significant variations in diagnoses among physicians. In “Accuracy of Diagnostic Procedures: Has it Improved Over the Past Five Decades?” Leonard Berlin argues that the medical community has been aware of the high rate of errors and clinical variations for about 50 years, a claim that he supports by discussing the groundbreaking research on diagnostic and radiologic errors conducted by L. Henry Garland in the 1950s [1]. Garland’s 1959 article, the basis for Berlin’s discussion, was the first to reveal the high percentage of physician inaccuracy in a variety of diagnostic procedures. Berlin argues that, though research over the past half century has confirmed Garland’s conclusions, the medical profession has been unable (or unwilling) to make the changes necessary to decrease the rate of error or incidence of variation among diagnosticians [1]. In light of mounting evidence and technological advances, this record causes us to ask why the profession has not taken steps to improve diagnostic accuracy.

Early Research

Garland’s research on the accuracy of radiologic and other diagnostic procedures revealed a “surprising degree of inaccuracy” including “a 34% error rate in the diagnosis of myocardial infarction,” an “agreement rate of only 7% among five experienced pediatricians” in the diagnosis of malnutrition in children, and “a 28% error rate among clinical laboratories in measuring the erythrocyte count” [2]. Another of Garland’s striking findings was a 30 percent disagreement rate among experienced radiologists in diagnosing pulmonary tuberculosis [2]. When Garland’s studies were published in the 1940s and ’50s, the high rates of error and disagreement within the profession came as a shock to physicians and were described by a personal friend of the author’s as “morally disturbing” [2, 3]. Berlin does not offer detailed discussion of Garland’s explanation for the rate of error and variability among clinicians, simply noting that he attributed much of the error in radiologic diagnosis to basic human variation and the “still unexplained human equation” [2].

In the years since Garland's research was published, other investigators have confirmed his findings. Studies of radiological technologies, such as the mammogram, have shown similarly high rates of inconsistencies [2]. Something not taken into account in this discussion of error rates is that, even though the proportion of errors remains the same, the increased use of many diagnostic procedures has benefited the overall health of more people. To use the same example as Berlin, the recommended guidelines for screening mammography and increased use of the technology by women have resulted in up to one-third more breast cancers being caught at an early stage than were detected at that stage before screening was recommended [4]. Probably, then, despite the consistent error rate, the findings from screening tests may have actually increased the number of people who benefit from these procedures.

Berlin looks closely at the ways in which error rate can be calculated and how different study methods affect the final report. The article explains how, if the denominator in the error rate calculation is the total number of patients screened, the error rate is bound to appear to be far lower than if the denominator is the number of patients who are positive for a given condition. In both cases the numerator is the sum of the missed positives and the false positives [2]. Moreover, some studies of medical error rates are not taken from the clinical arena but, for example, are conducted by giving a group of physicians a number of abnormal samples and calculating the error rate based on their performance [5]. The resulting error rates may serve well to demonstrate variability among physicians, but should not be interpreted as the error rate in clinical practice. Berlin notes that when the sample includes a mix of normal and abnormal cases, similar to what would be found in clinical practice, the error rate drops from an average of 30 percent to just 3.5-4 percent [5].

Though missing a positive finding will more than likely result, at the very least, in a delay of treatment for a patient, there does not seem to be an established link between those misses and the degree of harm caused to patients as a result. Berlin admits that this is an important shortcoming in his discussion of error rate and variability in diagnosis [5]. Furthermore there is no discussion of the rate at which inaccurate diagnoses are corrected early enough that the error is clinically insignificant. Both of these questions, though difficult to answer, are critical areas for exploration and study.

Berlin does not examine the ethical obligations of the medical profession when it comes to preventing error. What, for example, is an acceptable rate of inaccuracy? When should patients be told of variation in interpretation? What should be done if physicians agree that delay in diagnosis caused physiologic harm? What, if anything, is our responsibility to patients who receive false-positive reports and undergo further procedures unnecessarily? Should professional guidelines or practice standards recommend two or more readings of films?

In addition to patient-level outcomes, considerations of diagnostic errors in the health care system as a whole are missing from Berlin's analysis. The financial burden and resulting possible resources wasted on patients who receive false-positive results as well as the possible increase in the cost of care for those whose treatment is delayed (and whose disease progressed) because they initially received false-negative results are well worthy of future study. The ethical issue of access to limited medical resources and care is something that adversely affects all health care consumers. The 1999 Institute of Medicine (IOM) report "To Err Is Human: Building A Safer Health System," estimated that medical errors cost the United States approximately \$37.6 billion each year [6]. This estimate included all errors—not just diagnostic—and the whole spectrum of medical errors including adverse drug reactions, equipment failure, infection, surgical error, and misinterpretation of medical orders [7], must be addressed. In a previously published article, Berlin criticized the IOM report for the light in which it cast physicians, while at the same time noting appreciatively the increase in federal funding for programs like the Patient Safety Center that the report provoked [8].

More information on the specific financial burden of errors in diagnostic procedures will only help to clarify the magnitude of this problem and, as so much of our health care system is cost driven, possibly lead stakeholders throughout the system to work to decrease these types of errors. The medical profession is committed to reducing error and improving patient safety. Opinion 8.121, "Ethical Responsibility to Study Error and Prevent Harm," which first appeared in the American Medical Association's *Code of Medical Ethics* in 2003, guides physicians to "strive to ensure patient safety" and notes that they should "play a central role in identifying, reducing, and preventing health care errors" [9].

Can New Research and Technology Help?

It is too soon to know whether the advent of new radiological technologies including digital radiography and computer-aided detection (CAD) are helping to improve accuracy in diagnosis. CAD increases sensitivity and decreases variability of interpretation and has been shown to be of value for physicians, but Berlin seems unsure of whether, after decades of improvements in data and technology, CAD will be the golden ticket to decreasing an error rate that has remained unchanged for so long [5]. The research Berlin cites has been published within the past two years, so it is possible that the profession is still learning about and adjusting to these tools.

Several times in his conclusion Berlin returns to the truism that there will always be the element of human error to contend with [5, 10]. He fails to mention the efforts by an entirely separate field of medical research to examine why "perceptual and cognitive errors occur and what steps can be taken to ameliorate them" [10]. One specific aspect of cognition being explored is the precise capability of the human visual system with regard to displayed radiologic monitor images. The goal here is to present information in an easier-to-comprehend format and thus improve diagnostic performance [11].

Though the importance of Garland's findings and his effort to highlight degrees of disagreement and error in diagnostic medicine cannot be discounted, Berlin's views on emerging diagnostic technologies as well as the current efforts being made to reduce error seem overly pessimistic. The still-emerging and yet-to-emerge improvements in digital imaging, along with efforts to understand how human vision can best read and learn, are important steps being taken to fulfill the profession's ethical responsibilities to reduce or prevent error.

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CLINICAL PEARL

Breast Magnetic Resonance Imaging

Jeffrey B. Mendel, MD

When you receive the report on a breast magnetic resonance image (MRI) performed on one of your patients, how should you proceed? Breast MRI is a new and exciting technique that holds the promise of further improvements in screening as well as in the detection and management of breast cancer. Responding to the information in the findings report will soon become a routine part of modern breast care, but for many clinicians it represents another ingredient in the already cluttered recipe of modern breast care.

Since the advent of low-dose mammography, radiologists and clinicians have recognized that even the best mammography misses 10-20 percent of breast cancers [1]. Yet it has been the most relied-upon instrument for early cancer detection for over three decades. In the late 1980s, MRI emerged as a method to evaluate the integrity of silicone breast implants. The subsequent use of contrast-enhanced MRI allowed this modality to detect breast cancers that were not visible with conventional mammography and ultrasound. In 2007 the American Cancer Society issued a set of guidelines that will dramatically expand the use of contrast-enhanced breast MRI for screening patients who are at high risk of developing breast cancer [2]. Hence clinicians will be in the position of determining which of their patients might benefit from screening MRI and will confront a host of new questions based on the results of those tests.

MRI detects breast cancer by making it possible to image regions within the breast that are enhanced after the administration of intravenous, gadolinium-based contrast [3]. The findings are classified on the basis of their morphology and enhanced characteristics. Classic patterns of suspicious morphology include irregular or spiculated lesions as well as ductal enhancement (often described as linear-nodular). The most suspicious pattern of enhancement is the rapid wash-in and subsequent wash-out of the contrast medium, a so-called type 3 curve, but many malignant lesions can also demonstrate a plateau with persistent enhancement after initial wash-in—a type 2 curve.

To undergo a breast MRI, the patient must be able to lie prone in the magnetic resonance (MR) unit for approximately 30 minutes, must remain still during the 6- to 8-minute dynamic phase of contrast enhancement, and must be able to receive the gadolinium-based contrast. In premenopausal women, the appearance of the breast is dependent on endogenous hormones, so, at our institution, we limit breast imaging to

days 7 through 14 of the menstrual cycle to minimize hormonal effects. Nevertheless, there are some women in whom suspicious findings are hormonally related and are observed to regress on follow-up scans. This can also happen in postmenopausal women who are taking exogenous hormones. In these cases, the recommendation is to discontinue the exogenous hormones and repeat the breast MRI to determine if biopsy is needed.

Patients who undergo MRI fall into three broad categories: (1) those with known breast cancer for whom the study is being performed to aid in treatment planning or follow-up; (2) those who are symptomatic and in whom breast MRI is being used for problem-solving, and, (3), those who are at higher risk for breast cancer whose MRI is being performed to screen for occult tumors. I will not discuss the management of the first group, since these patients are typically managed by a team of breast cancer specialists.

The BIRADS Reporting Classification

The reporting of breast MRI uses the BIRADS (breast imaging reporting and data system) nomenclature like that used in mammography. This classification is designed to help clinicians recognize the key finding that the radiologist is trying to communicate. As with mammography, results from MRI are divided into 3 main categories using the BIRADS terminology.

BIRADS 1 or 2 (Normal or benign findings). From a management point of view, the chief difference between use of MRI for screening purposes and for symptomatic patients is the action taken subsequent to a BIRADS 1 or 2 designation. For patients whose risk status justifies screening with MRI, a benign MRI report leads to the recommendation of annual imaging using both MRI and mammography. For symptomatic patients, a benign result typically leads solely to clinical and mammographic follow-up.

BIRADS 3 (Probably benign). As in mammography, certain types of lesions show up on breast MRI that are highly likely to be benign but require repeat imaging. Patients with this type of lesion(s) are classified as BIRADS 3 (probably benign). Follow-up MRI is needed to confirm that these lesions are stable and is typically performed for a period of three years, with the first follow-up study at 6 months.

BIRADS 4 or 5 (Suspicious for malignancy). Patients with this category of results have lesions that are more suspicious and require tissue sampling. These lesions are the most challenging for both radiologists and clinicians. Despite recommendations that breast MRI be performed only at centers with MR-guided breast biopsy capability, many centers without this capability offer diagnostic breast MRI. As a clinician, it is important to assess the capabilities of your local imaging facilities before sending patients for a breast MRI. Patients tend to receive better care when the selected facility can either perform a full spectrum of breast imaging and biopsy procedures or has an established relationship with such a facility.

Next Steps

So how do radiologists decide what to do with a BIRADS 4 or 5 suspicious lesion on an MRI? As described above, the patient's hormone status affects the appearance of the breast on MR images. This is particularly problematic for perimenopausal patients in whom it is harder to schedule the examination so that it avoids the luteal or secretory phase. Depending on the appearance of the lesion, some of these patients may be asked to return for a repeat study in 2-3 months, in the hope that hormonally mediated pseudolesions will regress.

If you need to refer your patient to a separate facility for a biopsy, you can expect that some institutions will ask some patients to have a repeat MRI study. Because a variety of techniques are used in breast MR, many radiologists will not proceed without obtaining results using their own protocol. Once it is agreed that a biopsy is desirable, the radiologist will want to review any prior mammograms to confirm that the MR-detected lesion is occult on mammography. Many centers will also perform a breast ultrasound prior to MR-guided breast biopsy, since some MR-detected lesions are visible on a detailed ultrasound examination that focuses on the region of the suspicious lesion [4]. Our center recommends a focused ultrasound for those MR-detected lesions that are mass-like and approach 10 millimeters in diameter. Lesions that are visible by ultrasound are then biopsied using ultrasound guidance. While ultrasound-guided biopsy is an easier procedure for the patient, careful follow-up is needed to ensure that the correct lesion was sampled. This is particularly true if there is any discordance between the pathology results and the appearance of the lesion on MR. Lastly, some lesions cannot be accessed for biopsy using MR. For these patients, contrast-enhanced CT can occasionally be used to biopsy MR-detected breast lesions [5].

As far as the patient's experience, an MR-guided breast biopsy is similar to other image-guided biopsies with a few exceptions. The patient should discontinue medications that increase bleeding, such as aspirin, warfarin, and clopidogrel. Patients who tolerate diagnostic breast MR generally have no problem with the positioning for the biopsy, although the latter procedure takes somewhat longer (45-60 minutes) than the former. Patients should be aware that a tiny metal marker will be placed at the biopsy site at the conclusion of the procedure. This marker makes it possible to perform an accurate surgical biopsy in patients whose MR-guided biopsy demonstrates cancer. The marker is nonferromagnetic and will not set off the airport metal detectors. Once MR-guided biopsy is completed, the radiologist will hold manual compression at the site for approximately 10 minutes to minimize hematoma formation. Hematoma and ecchymosis are slightly more common than with other image-guided breast procedures. Patients can be given icepacks and instructed to use both ice and acetaminophen to minimize discomfort overnight.

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HEALTH LAW

Referral Schemes at Imaging Centers

Abigail Van Kempen

The Illinois Attorney General recently filed suit against more than 20 Chicago-area MRI centers, alleging that the centers participated in an increasingly common and widespread scheme to win referrals by paying illegal kickbacks to physicians [1]. This case and similar filings in Florida and Louisiana have caught the attention of both doctors and lawyers since a ruling could affect the structure and practice of radiology.

The expansion of independently owned MRI and other imaging centers has the potential to improve patient access to these services by containing costs and providing increased care to underserved populations. Special attention must be paid, however, to ensure that agreements between these providers and physicians do not run afoul of state and federal fraud and abuse laws.

The federal Medicare and Medicaid programs are the single largest purchaser of health care in the world, with federal expenditures reaching \$515 billion in fiscal year 2005 [2]. There are many opportunities to defraud this unwieldy system, and doing so can be lucrative. The Centers for Medicare and Medicaid Services (CMS) and the Office of the Inspector General for the Department of Health and Human Services have been proactive in countering fraud and abuse in the health care industry. Two federal laws in particular—the Medicare and Medicaid Antikickback Statute and the Stark Law—are sources for establishing the legality of physician financial interests in radiology facilities.

The antikickback statute prohibits knowingly or willfully paying or receiving remuneration in cash or services in exchange for prescribing, purchasing, or recommending any treatment, goods, or services for which payment will be made through Medicare, Medicaid, or any other federally funded health care program [3]. The statute prohibits not only overt kickbacks or bribes, but an array of significantly more complex economic relationships.

The antikickback laws work in combination with the Stark Law (named for Representative Fortney “Pete” Stark, a democratic congressman from California), which prohibits physicians from referring Medicare or Medicaid patients for designated health services (including radiological services) to an entity in which the physician or an immediate family member has a financial interest [4]. As in the antikickback statute, this financial interest is defined broadly, but both laws provide

a number of safe-harbor provisions. Most notably, the Stark Law makes an exception for the provision of in-office ancillary services. Violation of the Stark Law can result in nonpayment for the claim in violation of the law, exclusion from participation in Medicare and Medicaid, and civil monetary penalties of up to \$15,000 per violation [5]. Violation of the antikickback statute is a felony, and can result in a fine of up to \$25,000 and five years' imprisonment [6].

The practices at issue in the Illinois lawsuit, and in others around the country, are arguably in violation of the antikickback statute, the Stark Law, and similarly functioning laws protecting privately insured patients in 36 states. The scheme usually begins with imaging centers' offering leases to physicians. The sham leases make it seem as though the provision of these designated health services would fall under the Stark Law's in-office ancillary services safe harbor. The imaging center then charges the physician a discounted flat fee for each MRI performed. The physician bills patients' private insurer, Medicare, or Medicaid for the MRI at whatever rate those entities will reimburse, and the physician pockets the difference. In one scheme, group practice members were told they could net about \$843,000 over five years if they referred just five patients a day for scans [7]. The number jumped to over \$2.1 million if the practice referred 10 patients a day. These schemes seem to have led to an increase in the number of imaging scans performed, drastically raising Medicare and Medicaid costs. Between 2000 and 2005 Medicare spending for imaging services more than doubled, from \$6.6 billion to \$13.7 billion [8]. A 2004 study in the *Journal of the American College of Radiology* found that an estimated \$16 billion in diagnostic imaging was unnecessary and ordered by doctors who made money from having the procedure performed [9].

Proponents of these relationships can argue that, without physician interest and investment in imaging centers, some patients—particularly those in rural or underserved areas—would not receive the care they need. They may argue that physician involvement actually improves quality of care, inasmuch as physicians refer patients only to those centers where they will receive the best care, and that the doctor's integrity and ethical guidelines will limit referral for unnecessary scans. Opponents, however, look at the rising costs of care and the potential for huge profits and argue that whatever the best intentions of physicians may be, these relationships need to be regulated and maintained within the scope of the law. New rules regarding the Stark Law, set to be released by CMS by the end of 2007, and the eventual decisions in lawsuits such as the one brought by the Illinois Attorney General, should enable physicians to offer quality, necessary care to their patients, while remaining within the bounds of the law.

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POLICY FORUM

Mammography Quality Standards Act: Gains and Losses in Women's Health Care

Toby Schonfeld, PhD

Mammography is one of the best ways to detect breast cancer early enough that treatment can be expected to lead to good outcomes. And because breast cancer is the leading non-skin cancer in women and the second most common cause of cancer-related mortality in women [1], encouraging regular mammograms is an excellent preventive strategy.

At least in part because of the increased demand for breast imaging, the federal government has taken a marked interest in mammography services. Congress passed the Mammography Quality Standards Act (MQSA) in 1992 to better regulate the field of breast imaging. Specifically, the act sought to correct four areas of concern: (1) poor quality equipment, (2) a lack of quality assurance procedures, (3) poorly trained radiologic technologists and interpreting physicians, and (4) a lack of facility inspections or consistent governmental oversight [2].

Whether or not the MQSA has succeeded in resolving these problems in mammography remains an open question—there have been clear gains and losses in breast imaging as a result of the act. This commentary will discuss several of these.

Standards and Access

Prior to the implementation of the MQSA, the quality of breast imaging varied greatly by geography. Accreditation programs at the time were strictly voluntary; only half of all mammography facilities had applied for accreditation by 1991, and only half of those that applied had earned accreditation [3]. Many of the failures had to do with substandard equipment that produced images that were difficult to interpret correctly. As a result of the MQSA, equipment had to be upgraded or replaced to meet federal standards for image quality. Ensuring a high-quality image reduces the number of scans women must endure and enables physicians to report findings more accurately. Therefore, many believe that the MQSA improved the standard of care for women having mammograms.

Of course, an increase in the standard did not come without cost. Mammography facilities that could not meet the equipment or personnel requirements were forced to close or merge with others. Often financial considerations drove these changes. There is some evidence of long wait times for patients to access mammography services [4], but it is not clear whether there was a significant decrease in overall

access as a result of the regulations and subsequent facility closures and mergers [5]. This point is particularly applicable in areas with few mammography providers [6]. Regardless, it is clear that the MQSA did not *increase* access for women. Given that many of the small, community-based facilities that serve the health care needs of the poor and underserved are unlikely to be able to afford the equipment and personnel required by the MQSA, access remains a main area of concern.

Personnel

The MQSA established rigorous training and continuing education criteria for radiologists and mammography technologists. In fact, some claim that the training and reporting requirements are unique in medicine with respect to the governing of daily practice [6]. The standards require interpreting radiologists to read 240 mammograms during a six-month period to qualify for initial certification and then to read another 960 mammograms during the next two years [7]. Mammography technologists must, among other things, perform 25 supervised examinations to qualify for certification and then must perform at least 200 mammography examinations in the next 24 months to be certified [7]. There are also quality assurance procedures to ensure compliance with these and all other provisions of the regulations. Supporters of the act herald the experiential requirements as a way to improve the quality of care for women by requiring that mammograms be conducted and interpreted by individuals experienced with breast imaging technology.

Despite these stringent requirements, some evidence suggests that the current standards for radiologists are still insufficient. The more screening exams a radiologist interprets, the more accurate she is likely to be [8], but one survey of radiology residents found that they desired to spend less than one-quarter of their time on breast imaging [9]. The high rate of litigation and lower rate of compensation associated with this area of the specialty have been offered as possible reasons for decreased interest in breast imaging [4].

There is a corresponding shortage in mammography technologists. Some credit expanded career opportunities, especially those with better compensation, for the shift away from this predominately female career [4]. Satisfying the requirements for continuing education specified by the MQSA often means attending sessions offered only during uncompensated time at night or on weekends, which may serve as a disincentive to choose this specialty [4]. No matter what the reason, staffing has not increased to match the growing demand for high-quality mammography services.

Broader Implications

Despite the stated goal of the MQSA—to address deficiencies in mammography—the act itself does not specify directions for further refinement of the quality standards for mammography. For example, “increasing physician accuracy in interpreting mammograms” speaks to striving for greater specificity in reading scans. What it does not describe is the rate of false-positive (or false-negative) results that is acceptable in the quest for maximized specificity [8]. The false-positive rate in the United States is much higher than it is in some other countries [8]. Given that this

disease and its associated tests carry with them significant psychological burdens for women, this fact is alarming.

The psychological burden of breast cancer leads to the final set of considerations. Some laud initiatives like the MQSA that direct considerable health care resources towards an important aspect of women's health. Evidence remains strong that women receive different treatment in medicine [10-12], and therefore attending to an area that affects *women* specifically is an important shift in priorities.

Others, however, question the focus on breast cancer as the best way to improve women's health. Despite breast cancer's being the second leading cause of cancer-related deaths for women, it accounts for only 3.9 percent of all causes of death among women in the U.S. [13]. Diverting resources to the prevention of heart disease, increasing overall access to health care, and providing funding for transportation and child care would improve women's health more profoundly than higher mammography standards will [14, 15]. There may be other, more subtle motivations at work here related to the historic tendency to pathologize women's anatomy and to assuage guilty consciences over past diagnostic and therapeutic miscalculations [16].

What is clear overall about the 1992 MQSA is that the act established uniform quality among breast imaging facilities and ensured that professional staff involved in mammography met minimal qualifications. Whether or not these regulations resulted in overall positive changes for women and women's health has yet to be determined.

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MEDICINE AND SOCIETY

Radiologists' Ethical and Professional Obligations

Kay Denise Spong Lozano, MD

What do ethics have to do with radiology? This is a question that colleagues and even attending physicians asked me in medical school when I spoke of my interest in medical ethics and my plan to become a radiologist. “Become an internist instead,” they said, “so you can really deal with ethical issues.” As a radiologist, I’m not spending most of my day directly interacting with patients, but there is a patient behind every image, whether digital or film, and no physician, regardless of specialty, can ignore the principles of medical ethics in everyday practice.

Radiologists have been called the “doctor’s doctor.” This is an unfortunate label because we have duties not only to referring physicians, but also to patients. As the primary readers of medical images, we provide advice as well as interpretations. But those services are for the benefit of the patient. Informing the primary physician of a critical or unexpected result is a means to an end—the best care for the patient.

When a radiologist receives an order or request from another physician to perform an imaging study or procedure on a patient, he or she becomes part of the patient’s medical team. Clear and timely communication among all members of the team is essential to ensuring optimal use of medical imaging for the benefit of the patient.

The Radiologist’s Consultant Role

Each time an imaging study is ordered, radiologists must ask whether exposure to radiation is warranted. Imaging should be recommended only when it is in the patient’s best interest; that is, it should not be performed to avoid litigation, for financial gain, to reach a quota, when the outcome clearly will not affect the treatment plan, or because the patient’s family demands it. With few exceptions, imaging studies should follow clinical evaluation, not replace it or substitute for patient-physician communication [1].

When they receive requests for imaging studies that are not indicated for a particular patient, not the optimal exam for a particular indication, or actually harmful to the patient, radiologists must make their concerns known to the referring physician. Physicians order inappropriate or potentially harmful studies for many reasons, including the emergent nature of the situation, their lack of knowledge about state-of-the-art imaging, or, perhaps, their incomplete understanding of radiation exposure and its risk in vulnerable groups such as children and pregnant women.

When the study is needed for an emergent condition, the radiologist must be in close communication with the referring physician. This is essential, for example, in CT angiography for an unstable patient with renal insufficiency and a high clinical probability of aortic dissection. Patients with compromised renal function are at high risk of nephrotoxicity from intravenous contrast. Nevertheless CT angiography may be the most likely way to save the patient's life in certain situations. But there may be other instances in which patients with chest pain and renal insufficiency do not need a CT angiogram, and for whom the risks outweigh the benefits.

Unfortunately, in nonemergent cases it is sometimes easier and faster to comply with the request than to pursue discussions about its appropriateness. Denying a request or advising against it can lead the patient to question his or her physician's judgment, thus eroding the patient-physician relationship, and could antagonize the referring physician, resulting in a lack of cooperation among the patient's caregivers.

Occasionally a referring physician insists a study be done regardless of the radiologist's concerns. When patient-care team members know and trust one another, direct communication can usually resolve the misunderstanding; it often takes only a phone call to the primary physician to clarify the patient's condition and the reason behind the request or to convey the rationale for suggesting a different study. To this end, radiologists use the evidence-based guidelines found in the American College of Radiology (ACR) Appropriateness Criteria [2]. These criteria can assist in identifying or confirming the appropriate imaging study for certain indications and specific symptoms and findings. For all physicians who make decisions on imaging, the appropriateness criteria are an important resource for enhancing quality of care and ensuring the safe and efficacious use of imaging for patients.

Selecting the Best Imaging Modality

The radiologist's goal is to obtain the information that our referring colleagues seek, while using the modality that limits radiation exposure to a level that is "as low as reasonably achievable" (ALARA). Sometimes the use of alternative technologies such as MRI and ultrasound instead of CT and X-rays yield more or better information, while avoiding the use of ionizing radiation entirely.

Medical imaging studies have risen dramatically since the 1980s, particularly the use of CT imaging, which has increased sevenfold from 2.8 million annual examinations in 1981, to 20 million in 1995 [3]. Its growth continues, with an estimated 65 million scans performed in the United States in 2007 [4]. Although CT imaging comprises only 11 percent of all diagnostic radiology studies and procedures, the modality accounts for more than two-thirds of the radiation dose delivered to patients in the U.S. [5]. A single CT or nuclear medicine study can have an effective dose of 10 to 25 millisieverts (mSv) [6], compared to the estimated annual background radiation (natural or commonly produced artificial radiation) dose of 3 mSv per year. A single chest CT may have an effective dose of 8 mSv, which is the equivalent of 400 chest X-rays [7]. Given that many patients have multiple CT studies, the total estimated exposure for a patient, even in one hospitalization, could exceed 50 mSv. A study of

Japanese atomic bomb survivors showed a statistically significant increase in cancer risk with radiation dose estimates over 50 mSv [6]. Radiation from medical imaging, while providing significant benefit to many patients, may also confer a slight increase in risk of cancer [8, 9]. Thus it is vital that radiologists agree with the necessity and appropriateness of a scan.

Although safe dosage is emphasized in radiology residency training, many nonradiologists order and, at times, even interpret imaging studies, so it is imperative that the training of all medical students and residents include education in radiology safety. Patients are rarely given information about the radiation exposure from a CT scan or information regarding risks and benefits [10]. This may be partly because physicians are not aware of, or do not understand, the radiation dose and its effect. Ordering or performing a study without an appreciation of the potential risks of the radiation exposure is akin to ordering any other procedure or medication without knowing its risks.

Radiologists, specifically, are charged with the task of keeping radiation dose as low as reasonably possible for patients, but the responsibility falls on all physicians, particularly as nonradiologists become more involved in the business of imaging centers, thus potentially influencing their ordering patterns.

In the meantime, careful consideration of radiation exposure when ordering imaging studies, comprehensive accreditation of all imaging facilities, and use of appropriateness ratings for imaging studies may assist the medical profession in applying our remarkable diagnostic resources in a way that is safe, effective, and most beneficial for our patients.

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MEDICAL NARRATIVE

The Magic of X-ray Vision

Gretchen Case, PhD

X-rays have a particular sort of currency at the sanatorium in Thomas Mann's novel *The Magic Mountain*. "Ah, you carry it in a case. Like a certificate, as it were—a sort of membership card," says a fellow in-patient to our protagonist, Hans Castorp. And then, approvingly, "Very good. Let me see it" [1]. The tubercular residents of this mountaintop clinic commonly keep small copies of their X-rays in a pocket, ready for display and perusal. These "intimate photographs" are more precious than conventional portraits; Hans begs his beloved Clavdia for her own tiny X-ray print to hold as a memento during her absence from the sanatorium. While he pines for her, he looks into the little glass square and takes comfort and pleasure in the sight of her thoracic cavity. Patients at the clinic know each other as much by lesions and fevers as by names and faces.

The fictional Hans encounters radiology in the early 20th century, receiving a far longer exposure and less certain diagnosis than patients encounter in hospitals today. A medical team on rounds in a modern teaching hospital might gather around a computer screen outside the door of a patient's room, consulting the digitized record for evidence of illness or injury. Rather than producing prints on wallet-size glass plates, laptop computers and handheld devices make radiological images of the patient's body that are portable and can be retrieved almost instantly. Available imaging technologies offer much-needed information and clarification regarding a patient's condition and prognosis. Further, the allure of seeing that which is usually hidden from view intensifies when comfort, health, and even survival may depend on what is revealed.

Hans originally comes to the sanatorium only to visit briefly with a sick cousin, but the director, Dr. Behrens, is able to convince him to undergo a full evaluation. Hans accompanies cousin Joachim to an X-ray and is astounded at the image produced while Joachim sits in the midst of the impressive electrical "storm." Behrens points out Joachim's tubercular lesions,

but Hans Castorp's attention was taken up by something like a bag, a strange, animal shape, darkly visible behind the middle column, or more on the right side of it—the spectator's right. It expanded and contracted regularly, a little after the fashion of a swimming jelly-fish....Good God, it was the heart, it was Joachim's honour-loving heart, that Hans Castorp saw [2]!

In his awe-struck state, Hans is easily persuaded into position for his own X-ray image; Hans' pain is existential rather than physical, but he is eager to participate in the imaging process, and Behrens finds signs of tuberculosis in Hans, too. Hans embraces the X-ray as verifiable evidence of illness and soon joins the ranks of clinic residents, all preoccupied with measuring and monitoring the internal manifestations of their disease. Mann leaves his readers with the suspicion that Behrens—at least in some cases—sees tuberculosis because he is looking for tuberculosis.

Accepting his illness, Hans stays on the mountaintop for years and imbues the “moist spot” on his lungs with import beyond anything his doctor has diagnosed. On his knees before Clavdia he declares that “no doubt what Behrens found in my body are the lingering traces of my age-old love for you...” [3]. Hans equates the illumination of their internal physical structures with the revelation of their souls. He pleads for permission to touch Clavdia's body while describing it in clinical terms meant to convince Clavdia that loving her physically would also give him access to her very essence. Coy Clavdia fends off his seduction and takes her leave with the cruel and witty prediction “that you'll see a nasty rise in your fever chart this evening” [4]. Hans longs to see deep into Clavdia, into himself, and into the world in his search for meaning.

Mann's novel is, after all, a comment on broader social issues and not just a literal study of the angst of one man. The mountain clinic is a complex culture, full of characters who challenge and inform Hans. Through his interactions and conversations, we wrestle with questions of belief and experience, of nature and technology, of body and soul. When Hans receives that miniature X-ray print, he acquires a passport to what Susan Sontag metaphorically describes as the “kingdom of the ill” [5], made real in Mann's pages. Hans knows he is ill because the X-ray declares it so, and his doctor merely shows him how to see the proof in the picture. Although the diagnostic supremacy of this image is questioned at several points in the book, Hans and Behrens cling to its truth because it provides both of them with identity and purpose. This kingdom—this clinic—offers a framework for exploring the great questions of life, relying on tuberculosis as an ever-present reminder of death. Without the limits set by his illness, without his new status as patient (in turn dependent on Behrens' status as doctor), Hans would again be adrift in the wider world. On the mountain, each person is clearly defined, gauged by medical means more than by any other measure.

Nearly a century after Hans' sojourn on the magic mountain, images of the body's interior still have the power to seize the imagination and preempt any other form of visualizing a patient's condition. Patients are as susceptible as doctors to the persuasive power of these images, for it is hard to doubt what one sees (or does not see) with one's own eyes. But the act of looking never occurs outside a frame of reference, and attempts at objectivity depend on acknowledging the limits that come with that frame. When considering a fictional world, readers have the luxury of distance in making judgments on the narrated events. In the real world, that same perspective is hard to come by. Without a reliable, omniscient narrator and the

ingenious prose of a talented author to guide us, we can only do our best to find the boundaries of the conditions within which we operate. Hans Castorp and Dr. Behrens regard an X-ray and see not only a body but also an entire universe. We, doctors and patients alike, must attempt to see the universe as well as the body in the images held up for our interpretation.

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