

The Invisible Radiologist¹

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Since the discovery of the x-ray in 1895, radiology has become a prominent medical discipline. Radiologists are central to the function of hospitals and academic medical centers, and their training programs are producing leaders in medicine. The profession's strong research agenda is also greatly advancing medicine, and there is now an important imaging resource with interests strongly aligned with radiology: the National Institute of Biomedical Imaging and Bioengineering at the National Institutes of Health. However, according to a 2004 survey of 66 teaching departments and private facilities, 80%–90% of radiologists do not meet their patients (1), and a 2008 national survey by the American College of Radiology revealed that one in two Americans still does not know “whether a radiologist is a person who interprets or a person who administers the scan” (2). During four 2-hour focus groups in two states, adults aged 35 and older were split as to “whether a radiologist is a licensed physician or a technician” (2). Because radiologists have limited contact with patients, radiologists are physically invisible to them, and their role as physicians also remains hidden or invisible to most patients.

How did radiologists become so invisible to their patients? What were the major factors driving radiologists toward invisibility as the discipline evolved during the past century after the discovery of the x-ray? What is the long-term effect of losing visibility to patients?

The Early Years and Struggle for Increasing Professional Status

After the discovery of the x-ray, early radiologists attempted to affirm their status as medical professionals by claiming ownership of the radiographic image and its interpretation.

Many radiologists in the early 1900s lacked medical degrees and were typically

photographers, physicists, or amateur experimenters (3). Even after establishing the American Roentgen Ray Society in 1908, radiologists were still often considered glorified tradesmen both by the public (4) and two of the earliest medical disciplines: surgery (5) and internal medicine (6).

Initially, radiologists had direct contact with patients because they performed radiographic examinations and interpreted the results, which they sometimes communicated directly to their patients (7). In hopes of increasing their professional status, radiologists stopped giving images to patients, so that patients would know that they were paying for a medical consultation and not a photograph (8). The medical community affirmed that the image was not the patient's property, and, in 1916, the American Roentgen Ray Society advised radiologists to communicate results only to referring physicians and not to patients (9), so that referring physicians would regard radiologists as medical experts. By 1922, the American Registry of Radiologic Technology was established (10), which described the qualifications and licensure requirements for technicians. To enhance professional prestige, a practice model was created in which radiologists limited their role to interpreting results and used technologists to perform examinations. By ceasing to perform imaging examinations and communicate results to patients, radiologists began to become invisible to patients.

Hospital economics further displaced the radiologist from patient contact. The increasing expense of radiologic equipment in the 1930s made hospitals an attractive place for radiologists to practice because of lower overhead expenses (11). However, rather than create separate departments of radiology, most hospitals included a radiologist as a member of a section in the department of surgery (12), an organizational design

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further distancing the radiologist from direct patient contact and recognition because the service and its operation were under the direction of surgeons.

Although radiologic studies began to generate substantially increased revenues, hospitals restricted the radiologist's access to this income stream, diverting it instead to cover the costs of other departments while maintaining radiologists as salaried employees. By collecting both the fee for the technical and the professional components of radiologic examinations, hospitals made radiologists invisible to patients through the billing system and prevented them from exercising their rights as physicians to bill for their services independent of the hospital (13).

This disappearance from the billing system was further entrenched by a marked rise in hospital insurance contracts in the 1930s, with the dominant player, Blue Cross, categorizing radiology as a hospital service, not a medical service, thus removing the radiologist's access to fee-for-service compensation (14). By the early 1940s, radiologists no longer billed patients for payment of imaging services, which were instead billed and collected by the hospital.

Invisibility in the Predigital Era

The creation of new radiologic techniques and clinical applications, as well as the initiation of formal radiologic training, signaled an increase in status for radiology within the medical community in the decades that followed (15). By 1961, 69% of radiologists had added their names to hospital billheads (16), which made it clear to patients receiving radiology bills that a radiologist had interpreted their studies. This trend toward greater professional visibility gained momentum through the passing of the Medicare bill in 1965, which classified radiology as a medical service and allowed radiologists to bill patients directly according to a fee-for-service model like other hospital physicians. An American College of Radiology survey indicated that 3 years later 70% of respondents were billing their own professional fees (17).

As the professional reputation of radiologists grew, the demand for their services increased, and radiology departments in academic medical centers were flourishing. In the 1960s, the demand for radiologic procedures was growing by 7% each year (18). According to a 1964 study by the U.S. Public Health Service, 100 000 000 diagnostic examinations were performed annually in the United States, which was equivalent, on average, to one diagnostic procedure for every two individuals in the population each year (18). By 1968, radiology was ranked fourth (8%) of 10 specialties in terms of the number of U.S. graduates entering residency training (18).

Despite this increase in professional status, academic departments of radiology did not develop programs to train their residents to communicate with patients. Most radiologists still adhered to the older model of hospital-based practice, which eschewed direct patient interaction. Not surprisingly, a survey by Eastman Kodak in 1956 confirmed that radiologists were essentially nonexistent to their patients, with less than one in four patients aware of the crucial role of a radiologist in patient diagnosis (19).

The Invisible Radiologist in the Digital Era

Since the development of computed tomography in the 1970s and magnetic resonance imaging in the 1980s, diagnostic radiologists have generally become less visible to their patients, with the exception of a few subspecialties, such as interventional radiology and gastrointestinal radiology, in which the radiologist performs the examination. In most subspecialties, a technologist performs the procedure, and the radiologist is invisible to the patient. Furthermore, picture archiving and communication systems and teleradiology have enabled radiologists to provide radiologic services for multiple sites but have simultaneously reduced contact between radiologists and their patients (20).

Some radiologic subspecialties have recently taken the lead in reversing this radiologist-patient disconnect, including

nuclear medicine, mammography, pediatric radiology, and ultrasonography. In diagnostic mammography, radiologists routinely speak with patients regarding their mammographic results (21). In a 2006–2007 survey of 243 radiologists, 77% often or always communicated the abnormal results of diagnostic mammographic examinations to their patients, although less than 47.3% communicated the normal results of diagnostic examinations (22). Similarly, some pediatric radiologists communicate the results of imaging examinations to their patients, or patients' parents (23), as do some radiologists in ultrasonography (24). Concurrently, several medicolegal decisions have emphasized the radiologist's duty to communicate results directly to patients (25). The development of Web-based models of communication has provided another avenue to enhance radiologist-patient contact (20). However, patients value a visible radiologist with whom they can talk about their imaging studies (26).

Despite these attempts to increase direct communication, numerous structures within the hospital environment continue to impede full visibility between radiologist and patient. Hospital radiologists are often physically separated from patients by geographically distant offices. Unlike other hospital physicians, radiologists lack consulting rooms and are typically not provided with a care delivery team composed of nurses and physician extenders, whose services would allow radiologists more time for communicating with patients.

Hospital practice models are based on a system created during the 1920s and 1930s. Today, the common classification of radiology as an "ancillary service" by hospitals and insurance companies reflects the perpetuation of this outdated practice model. One of the earliest uses of *ancillary* in reference to radiology appears in the surgical literature from the mid-1920s, which characterizes radiology as ancillary and as a supplement to surgical diagnostic methods (27). Considered an ancillary hospital service, radiology was not regarded as integral to medicine according to one

radiologist from 1939: “There has been an unfortunate tendency for some hospitals...to look upon the radiologist as a technician employed by the hospital, filling an ancillary role in the practice of medicine” (28).

In many respects, the role of the radiologist has not changed substantially. Viewed as subordinate or supplementary to the services of the primary care physician by hospital administrators, the role of the radiologist can be similar to the Latin word from which *ancillary* is derived: *ancilla*, which means handmaid (29). Hospital administrators are reluctant to give ancillary services, such as radiology, resources that might increase radiologist-patient interactions, such as consulting offices, offices near patient care areas, and the expansion of patient-care delivery teams.

Even the shift from hospital-based inpatient imaging to radiologist-controlled outpatient imaging centers in the past 2 decades has not solved this dilemma of minimal radiologist-patient interaction. Increased imaging volume is the primary reimbursement criteria rewarded by third-party payers, particularly for outpatient imaging centers. This reward system acts as a disincentive for physician engagement in activities that are time-consuming and that lack a concomitant increase in imaging volume, such as direct patient consultation. Compounded by a dearth of historical models for radiologist-patient interaction and insufficient medical school training in communication, this reimbursement system creates a disincentive for direct interaction between radiologists and patients becoming the accepted standard of practice.

The Necessity to Change

The problem of limited patient contact also pervades pathology. Like radiology, pathology has historically been a hospital-based specialty that is essential to diagnosis in patient care with dependence on technology and with limited or no patient contact. Consequently, pathologists are mostly invisible to their patients as evidenced by a 1996 survey in which half of the patients interviewed had no idea what a pathologist's role

was, while 30% thought that the pathologist's responsibility was limited to performing autopsies (30).

The evolution of pathology demonstrates the importance of patient contact in the successful development and survival of a medical discipline. Both radiology and pathology have achieved very high status in medicine over the course of time. While radiology is still high in status, pathology has declined, partially because of a lack of demand for its services previously held in high regard, such as autopsy. More recently, the commoditization of pathologic studies, particularly blood testing in clinical laboratories, has been one of the major factors diminishing the status of pathology.

In the early years of the 20th century, pathology was considered the scientific foundation of medicine, which led to the founding of many powerful pathology departments in academic medical centers throughout the United States (31). However, in the 1930s, the status of pathology began to diminish. Unlike other medical specialties, pathologists did not directly consult with patients, and many physicians did not believe pathologists could help with their diagnoses, so there was not adequate demand for pathology services. Also, autopsy began to lose its value as a diagnostic tool (32).

Pathology had become a “specialty with a glorious past but no future” by the 1950s, according to William Rothstein, PhD (32). Rothstein concluded that “[t]he boom years of pathology are over” (32). By the 1970s, academic pathology in some medical centers was “a discipline without a specialty,” and some pathology departments were headed by chairs from other departments who had been appointed by the dean (32).

As academic pathology departments declined, clinical pathology laboratories experienced a surge at community hospitals in the 1950s (32). Hospital pathologists served a critical function by helping “public health officials learn about communicable and infectious diseases in the community” (32). Because most hospital pathologists focused more on community health than the individual

patient, hospital pathology became “a major means of monitoring community health” (32). By 1969, clinical pathologists were being used to oversee lay laboratories in such large numbers that clinical pathology “changed from a medical specialty to an industry” (32). What in the past had been a consultative service to other physicians and to patients had become a commoditized test.

This trend continues in the present. The industrialization of blood chemistries, cost and reimbursement issues, as well as a lack of patient contact have all contributed to the transformation of hospital laboratories into “cost centers.” Automation has reduced labor-intensive work to technology-intensive work, and laboratory results (and some anatomic pathologic diagnoses) have become commodities, not services (33). Because they have limited patient contact, laboratory professionals are “endangered,” serving as dispensable workers who produce products rather than indispensable members of a health care team who provide services individualized for each patient (33).

Anatomic pathologists are also experiencing a similar commoditization of pathology services. Because of the growth in information technology, anatomic pathologists have become invisible producers of information about tests rather than providers of services, such as the interpretation of test results and consultations with physicians as well as patients (34).

Recognizing the great value of direct patient contact, some pathologists are now struggling to become more visible to patients through the direct communication of results (35), advocating for a future of pathology “at the patient's bedside” (32) and in a more patient-centered medical discipline (36).

Conclusion

The history of pathology holds an important lesson for radiology. Like our profession, pathology is a hospital-based discipline with limited or no patient contact and with advanced technology, which has led to robust, reproducible

test results regardless of the location of the laboratory or which physician is overseeing the laboratory. Because identical test results can be obtained no matter which laboratory processes them, the only factor differentiating clinical pathology tests is cost; this standardization has caused the commoditization of pathology.

Many of the factors that led to the commoditization of pathology are also operating in radiology. Today, some claim that our discipline is being commoditized by the growth of teleradiology and picture archiving and communication systems, which have enabled the remote interpretation of images by an invisible radiologist isolated from patients (20,37). Our efforts to eliminate variation in image acquisition and interpretation have improved the overall quality of imaging; however, a by-product has been the threat of the commoditization of imaging that can only be differentiated by price (37). However, this is not completely accurate because cost is not the only factor differentiating imaging services, such as the prescribing of examinations and the interpretation of images. Unlike pathology tests, these services are not commodities because they vary according to the expertise of the radiologist who personalizes them by determining, on a case-by-case basis, the appropriate imaging test, the specifics of image acquisition, and the interpretation of images.

However, the invisibility of radiologists perpetuates the misperception that many imaging services are commodities. By offering an even higher level of personalized service through direct communication, radiologists can dispel this viewpoint by showing patients that they customize imaging examinations to fit each patient's individual health care needs. While a key component in increasing radiologist-patient interactions is the direct communication of imaging results, there is little consensus on how and when to communicate results to patients, and the arguments range from "don't tell," "tell if asked," "ask to tell," and "always tell" (38). Although direct communication may not be appropriate in every instance, we strongly agree

with the American College of Radiology that direct communication of results to patients should be the overall, long-term goal of our profession (39). In the meantime, there are small steps radiologists can take to accomplish this goal, such as introducing themselves to patients, explaining imaging examination procedures, creating patient-friendly imaging reports, and designing radiologic facilities that promote comfortable doctor-patient interactions.

An important trend in medicine is the movement toward more personalized health care by using techniques and therapies of molecular medicine. Radiology plays an important role in this trend through early disease detection as well as through the monitoring of personalized medicine and targeted therapies by using anatomic, functional, and molecular imaging. Because a medical care delivery model for personalized medicine has not yet been established, we have a great opportunity to shape this model and improve patient care by becoming a more visible member of a patient's health care team. This will help the patient, as well as the discipline of radiology, by creating a new culture of improved health care.

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