Teleradiology

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KEYWORDS

• Teleradiology • Radiology • Imaging • Subspecialists

KEY POINTS

- Picture archiving and communication systems and the Internet are the key enablers of teleradiology.
- More than half of the radiology groups in the United States are covered by a nighthawk service.
- Teleradiology is improving patient care by bringing subspecialist interpretations to small and rural practices.

The times they are a-changin'
—(Robert A. Zimmerman aka Bob Dylan, 1964)

Teleradiology has probably been around in one form or another since there were radiologists. In the early days of the last century, plain films taken in physicians' offices were sometimes couriered to radiologists for expert interpretation. In the early days of magnetic resonance (MR) imaging almost 3 decades ago, I received images by FedEx and interpreted them remotely before dictating a report or calling the referring radiologist. Although these methods of dissociating the site of image acquisition from the site of interpretation could be called teleradiology, a more modern definition would involve sending digital images over the Internet. With the widespread implementation of picture archiving and communication systems (PACS) and increasing Internet bandwidth, teleradiology for nighttime coverage and daytime subspecialty reads became possible approximately 20 years ago. This article reviews the history of teleradiology with parallels to the changing times of radiology as a specialty and the recent advent of the Digital Age. It examines the bright and dark sides of teleradiology with regard to lifestyle, quality interpretations, and potential for commoditization and predatory practices.

A little more than 50 years ago, radiologists were viewed as ancillary.[1] They did not provide nighttime or weekend coverage; they just read out whatever accumulated during the off hours during the next business day. There was not much demand for them to provide after-hours readings because most clinical specialists thought they could read radiographs as well as radiologists. Most radiology groups consisted of fewer than 5 so-called utility infielders, interchangeable and generalists, who covered all the bases. Because it did not really matter who read what, they might have been considered to be a commodity. With the introduction of computed tomography (CT) and then MR imaging, most clinicians realized that they did need radiologists for the interpretation, and that they needed them 24/7. Add to this the trend toward increasing subspecialization, and the fellowship-trained radiologists were becoming part of the clinical team, and clearly not a commodity. Radiology groups were also tending to increase in size to adequately load the radiology subspecialists with work.

Radiology took a step backward with regard to commoditization with PACS.[2] Before full PACS implementation several years ago, our clinicians used to come down to the Radiology Department to discuss their cases. It was good for us because

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the clinicians either provided additional history, which might lead to a better diagnosis, or confirmed a diagnosis already made, which is important feedback about our image interpretation skills. In the process, we got to know each other. Over time, if we generally provided accurate interpretations, the clinician would make allowances if we subsequently made an error. Some clinicians wanted specific, personalized radiologists to review their cases. As mutual respect was developed, we found ourselves supporting each other on potentially contentious medical staff issues.

Now that PACS has been fully implemented, we rarely see our clinicians. They can see the images and read our reports in their offices, or in the clinics or on the floors of the medical center. What a time saving in a medical world where efficiency is paramount! The only time the referring physicians now call is when they disagree with a reading. They rarely come to the Radiology Department anymore because we can each access the same image on PACS from different locations to discuss over the phone. As a result, many of the clinicians cannot put a name to the face of many of our junior faculty, fellows, and residents (and vice versa). The camaraderie of the old days is gone and we are being increasingly commoditized. Furthermore, with increasing priority being placed on productivity, many radiologists do not even want to see or talk to the clinicians because it just slows them down with non-relative value unit (RVU)-producing work.[3] So although I do not disagree that teleradiology may contribute to commoditization, I think the real culprits are PACS and a culture that is becoming increasingly RVU-driven because of the decreasing reimbursement for radiology examinations and the desire to maintain income. When the only activity that provides bonuses is image interpretation productivity, and not friendly consults or attendance at tumor boards, radiologists adapt, and not necessarily in a good way.

This article discusses nighttime coverage and daytime subspecialty readings separately because they evolved independently.[2]

NIGHTTIME COVERAGE

Nighttime coverage has gone through 5 stages: (1) wake up and drive to the hospital, (2) wake up and read from home, (3) stay up at night and cover the emergency department (ED) internally, (4) outsource nighttime coverage to another US-based group working at night, and (5) outsource nighttime US coverage to another group working from offshore where it is daytime. Each of these stages is discussed from my personal experience.

Stage 1: Wake up and Drive into the Hospital

When I started practicing radiology in 1981, I had to drive my Toyota Celica into the hospital to read an emergency film. Each call resulted in about 2 hours of lost sleep, but at least we were awake by the time we arrived at the hospital. If the emergency room (ER) physician was reasonable, he would not call us in, except for extreme emergencies, such as a lateral cervical spine film for a broken neck (which turned out not to be as accurate as we thought once we started doing CT). The ER physicians would interpret the films at night, render treatment based on that interpretation and we would do the official reading the next morning. If there were a discrepancy, we would contact the ER and they would contact the patient if a different treatment was needed. This process was not exactly optimal patient care nor was it optimal for radiologists because they also had to work the next day after occasionally coming into the hospital the night before.

Stage 2: Wake up and Read from Home

In the mid-1980s, the first camera-on-a-stick teleradiology systems became available. I can remember our radiology group discussing whether we really wanted to adopt this technology because it might increase the number of times we were called at night. Although ER physicians might have a high threshold for calling us physically into the hospital, they would likely have a lower threshold to ask us to look at cases from a video unit in our homes. It turned out not to seriously affect the number of cases we were asked to see at night and it had the advantage (for us) that we could view the images at our bedside and not fully wake up. Reading a study while half asleep might not be thought to be optimal patient care, but this was the standard of care for the next decade, and I still dreaded my nights on call. It was the worst part of being a radiologist.

Stage 3: Stay up at Night and Cover ED Internally

In 1993, the Office of the Inspector General realized that management of patients at night was being based on the ER physician's interpretation of the images, not our interpretation the next morning. They decided that they would only pay for contemporaneous readings.[4] At that time, I was part of a 60-person radiology group (Memrad Medical Group, Inc.) that covered 7 hospitals in southern California. Memrad's president (Paul Berger, MD) realized that this ruling could potentially result in a significant loss of income to the