Patterns of Use and Satisfaction With a University-Based Teleradiology System

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The Radiology Department at the University of Arizona has been operating a teleradiology program for almost 2 years. The goal of this project was to characterize the types of cases reviewed, to assess radiologists' satisfaction with the program, and to examine case turnaround times. On average, about 50 teleradiology cases are interpreted each month. Computed tomography (CT) cases are the most common type of case, constituting 65% of the total case volume. Average turnaround time (to generate a "wet read" once a case is received) is about 1.3 hours. Image quality was rated as generally good to excellent, and the user interface as generally good. Radiologists' confidence in their diagnostic decisions is about the same as reading films in the clinical environment. The most common reason for not being able to read teleradiology images is poor image quality, followed by lack of clinical history and not enough images.

THE PRACTICE OF RADIOLOGY has been changing dramatically over the past few years. Teleradiology is becoming more prevalent as a means of reaching patients in rural areas.[1-3] As the practice of teleradiology grows, so does the need to maintain good quality control and assessment procedures. Some important aspects of quality control are: how quickly are teleradiology cases read and a report generated for the referring site, how confident are the radiologists in their diagnostic decisions, and how do the radiologists rate the quality of the images and the teleradiology system. The goal of this study was to assess these variables in the context of the teleradiology application of the Arizona Telemedicine Program.[4] The teleradiology program provides specialist support to rural hospitals and other radiology departments associated with the University Medical Center. Four sites in Arizona are currently supported with a dedicated teleradiology system: two local hospitals within the city of Tucson, and two rural hospitals in eastern central Arizona. Services include specialty consultations, over reading in support of the rural physicians, and backup coverage when rural physicians are out due to illness or vacation. The teleradiology facility provides a dedicated teleradiology viewing station (Lumysis, Sunnyvale, CA) that is Digital Imaging and Communications in Medicine (DICOM) Compliant and provides specialized functions for image display and manipulation (eg, window/level, zoom, pan). Three remote sites currently use dial-up based transmission, and one sends cases over the high-speed Arizona Rural Telemedicine Network. Two of the dial-up sites will convert to high-speed transmission in the near future. In general, the residents in the Radiology Department do the wet read and provide an initial report for the referring site. Staff radiologists over read all cases and compile the final report. Teleradiology cases are read 24 hours a day, 7 days a week. Most cases are received in the evening and night hours, but a number of cases are received for interpretation during the day.

MATERIALS AND METHODS

To evaluate turnaround times (time from receiving a case to the time a wet read is conducted), we examined the teleradiology log book kept by the department. This log book records every teleradiology case that is sent to the Radiology Department for consult, and includes the type of case, number of images, date, and time received. The date and time each case is read out is recorded on the wet read report form that is generated for each case and faxed back to the sending site. To evaluate how the radiologists feel about the teleradiology system, image quality and types of cases read, we developed a short survey that was sent to every member of the Radiology Department.

RESULTS

To date, almost 1,100 teleradiology cases have been read: 70% computed tomography (CT), 15% ultrasound (US), and 15% other modalities. CT head cases are the most prevalent case type (44% of the total), followed by CT abdomen cases. On average, about 50 cases are read each month, with only minor fluctuations in volume from each of the four sites.

Seventeen faculty, one fellow, and six residents responded to the survey. Seventy-nine percent of the respondents have used the teleradiology system. The number of cases read by the respondents

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varies—some radiologists read more cases than others. This variation in the number of cases read by different radiologists is in part due to the types of cases that are sent for consultation. Since most of the cases are CT head, the neuroradiologists tend to read the majority of cases compared with those specialized in other areas. Thirty-seven percent of the respondents have read one to 10 cases, 21% 11 to 20 cases, 10% 21 to 30 cases, 16% 31 to 40 cases, 5% 40 to 50 cases, and 11% have read more than 50 teleradiology cases. When asked what type(s) of cases they typically read, 18 said CT, seven said US, seven said bone, and four said other.

Not all cases had a reading time indicated on the wet read forms. Approximately one third (296) of the cases did have the reading/reporting time recorded, and the results are based on these data. The average turnaround time (time from case received until a wet read report is generated) for the teleradiology cases has been 1.27 hours (SD 2.29). Overall, 69.5% of all the cases have a wet read in less than 1 hour, and 96% of the cases have a wet read in less than 6 hours.

The majority (63%) of radiologists rated the images as generally being of excellent or good quality and the user friendliness (90%) of the system as being excellent or good. The survey also asked the radiologists to rate their diagnostic confidence compared with traditional film viewing. Forty-two percent responded that their confidence was about the same as film reading, while 68% said that it was lower. The main reason (71% of responses) stated for having lower diagnostic confidence was poor image quality. Not having a clinical history (14.5%) and not having enough images (14.5%) were reported as reasons for not having high confidence less often. Twenty-six percent of the radiologists stated that there were some cases transmitted that could not be read at all due to poor image quality. This represents a small number of cases (<5%), and most of these are able to be retransmitted with better success.

DISCUSSION

Our experience with teleradiology over the past 1.5 years has been quite positive overall. More than 1,500 cases from four sites have been read via teleradiology. In general, the radiologists are satisfied with the teleradiology system itself and the general quality of the images that are sent. Sometimes, however, there are cases for which the image quality is poor and the actual film images are still requested to be sent by courier. This happens more often with digitized plain film images than with CT, US, or magnetic resonance images. The most common complaint about the system is that it takes too long to transmit the images. For the dial-up sites, the transmission time and connection dropouts present a significant inconvenience. The conversion of two sites to the high-speed network will improve the transmission speed and reliability. The average turnaround time for the sending institution to get a wet read report back is less than one hour for the majority of cases. This compares to an average turnaround time of about 6 hours when cases are sent by courier, representing a significant savings in time, which might have an impact on patient care.

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