

Outsourced Teleradiology Imaging Services: An Analysis of Discordant Interpretation in 124,870 Cases

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Purpose: Outsourcing after-hours radiology coverage to a teleradiology coverage company has become common in recent years. However, concerns have been raised over the quality of these types of coverage and the implications on patient care. This study details the quality assurance program of a teleradiology company that provides after-hours coverage to 64 California hospitals.

Method: The records of all examinations interpreted by 10 radiologists during 2003 were reviewed. Interpretations were compared with the final interpretations of the host practices and evaluated for timeliness.

Results: A total of 124,870 radiologic studies were interpreted by 10 teleradiologists during 2003. Computed tomography (CT) comprised 74% of these examinations: CT head (35%) examinations were the most commonly transmitted examinations, and CT abdomen/pelvis examinations were the second most common studies (27%). The average turnaround time was 12.2 min; 93% of the examinations were reported within 30 min, and 99% were completed within 1 hour. The overall discordant rate for individual teleradiologists ranged from 0.70% to 1.41%, with an average of 1.09%. Of the most commonly ordered examinations, CT of the abdomen/pelvis had the highest rate of discordance, at 2.1%.

Conclusions: Outsourcing to a teleradiology program with an active quality-assurance program can be safe. An active quality-assurance program should be an integral component of any teleradiology program. Constant feedback improves the performance of the radiologists.

Key Words: Teleradiology, nighthawk, off-hours radiology coverage, quality assurance, discrepant interpretation, misdiagnosis, interpretation error

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With the tremendous increase in demand for after-hours imaging, outsourcing to an after-hours teleradiology service has become a common method of providing after-hours radiology coverage for many radiology groups [1,2]. Although there has been discussion about the importance of quality assurance (QA) programs in these services, very little has been reported in the radiologic literature concerning such programs.

Teleradiology Diagnostic Service, Inc. (TDS; Arcadia, California), is a teleradiology company that provides after-hours services (6:00 pm to 7:00 am daily, 365 days

per year) to 64 California hospitals. It has an ongoing active QA program with which all reported disagreements are actively tracked. This study reports on the statistics of this QA program for all examinations performed in 2003.

MATERIALS AND METHODS

TDS was established in December 1997. The methods of transmission and communication between the central station (in Arcadia, California) and the various hospitals have significantly changed since inception as technology has evolved. The following describes the protocol that was in place during 2003.

Before the transmission of the studies, the hospital technologists were requested to submit a requisition via facsimile transmission to the central office. Images were transmitted by using a WinRad (Line Imaging, New York, New York) teleradiology system with 128-bit se-

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cure socket layer (SSL) encryption over broadband Internet connections Tier 1 (T1) or digital subscriber line (DSL) or a direct point-to-point T1 connection. Requisitions were matched with the transmitted images. The studies were reviewed by the radiologists with DR System Workstations (San Diego, California) or WinRad viewing software. Preliminary reports were generated by using a database reporting system and were transmitted via facsimile to the emergency room or to the patients' nursing unit. Positive findings that were considered to have immediate effects on the patients' immediate management were called directly to the attention of the attending physician. The timeliness of the reports was tracked by using time stamps for the receipt of the requisition, the completion of the image transmissions, and the faxing of the reports. The turnaround time for a report was defined as the difference between the time of faxing of the preliminary report and the time of completion of transmission of images or the time of submission of requisitions, whichever was the later.

Upon the completion of a shift (6:00 pm to 7:00 am), a daily log that provided a complete listing of cases, including the radiologists' preliminary reports, was faxed to each facility. As the cases in each hospital facility were being reviewed by the staff hospital radiologists, the final and preliminary reports were compared for accuracy. Any discordances were noted and categorized as agreed, informational only, minor disagreement (discordant findings that do not have a significant effect on patient management), or major disagreement (significant discordant findings that may have untoward effects on patient outcome). The discordant findings were noted by the hospital radiologists on the daily log sheets, which were faxed back to the central office. All discordant findings were entered into the database. The discordant cases were then reviewed by the teleradiologists, and any additional comments by teleradiologists were entered into the database and faxed back to the hospital facilities. Interesting cases and significant misses were often reviewed by several radiologists for teaching purposes. On an annual basis or upon request by the hospital facilities, the discordant statistics of the teleradiologists were supplied to the hospital facilities for their committee review.

RESULTS

All 10 teleradiologists were board-certified by the American Board of Radiology. Of these 10 teleradiologists, 2 had special certification in neuroradiology, 4 were fellowship-trained in body imaging, 1 was fellowship trained in nuclear medicine, and 2 had fellowship training in interventional radiology. Only 2 teleradiologists had less than 2 years of private practice experience before joining the teleradiology service. The remaining 8 radiologists had a

minimum of 5 years of private practice radiology experience before working as teleradiologists.

During 2003, preliminary reports were provided by 10 teleradiologists on 132,189 examinations. There were 98,328 (74%) computed tomography (CT) scans, 25,935 (19.6%) ultrasound (US) studies, 1935 (1.5%) nuclear medicine studies, 1032 (0.8%) magnetic resonance (MR) studies, and 4959 (3.8%) radiographic studies. Of the 64 hospitals, 6 hospitals did not report any disagreements to the central office during 2003. These 6 hospitals accounted for 7319 (5.5%) cases transmitted. Because of the lack of feedback from these hospitals, these 7319 cases were excluded from this study. The following is an analysis of the remaining 124,870 cases.

The distribution of the type of examination, along with their percentage of the total, is shown in Table 1. The 10 most commonly requested examinations were CT of the head (35.4%), CT of the abdomen/pelvis (26.5%), abdominal US (6.9%), pelvic US (4.4%), obstetric US (3.9%), CT of the chest (2.9%), chest radiographs (2.8%), CT pulmonary angiography (2.7%), CT C-spine (2.3%), and lower extremity venous duplex scan (1.8%). These 10 examinations comprised 90% of all the examinations performed.

The average turnaround time for reports for the year was 12.2 min, with a standard deviation of 43 min and a range of 1 min to 12 hours. The median turnaround time was 8.8 min; 93% (115,797) of the total number of cases were reported within 30 min, and 99% (123,491) of the cases were reported within 1 hour. Most of the delayed cases (turnaround time >1 hour) were due to incomplete transmission of images ($n = 523$), request for prior studies ($n = 125$) for comparison, or inability to contact the technologist when there was a question regarding the examination ($n = 247$).

There were 1367 discordant cases reported. Of these, 469 were categorized as informational only, 740 were categorized as minor disagreements, and 158 were categorized as major disagreements. The overall systemwide discordance rate was 1.09%, with 0.38% informational only, 0.59% minor disagreements, and 0.13% major disagreements. The discordant rates for the individual teleradiologists were relatively similar and fell within a narrow range (0.70%–1.41% for overall disagreements). The distribution of discordant statistics for the teleradiologists is shown in Table 2.

Table 1 also tabulates the type of disagreements vs. the type of examinations. Of the 10 most common examinations, CT of the abdomen/pelvis had the highest discordance rate (2.1%). Only miscellaneous MR examinations (pelvis, ankles, wrist, feet, and so on) had a slightly higher discordant rate (2.6%). Examples of discrepancies for the 10 most common examinations are shown in Table 3.

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