Integration of Radiologist Peer Review Into Clinical Review Workstation

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Professional peer review of random prior radiologist's interpretations is mandated by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO). The JCAHO expects documentation of 5% rate of random peer-review cases. Countless hours are spent in departments fulfilling these requirements. The integration of the peer-review process into the radiologist's interpretation workflow was expected to increase the percentage of documented peer review, yet decrease the time and effort for this documentation. radStation clinical review workstations are deployed at every reading station. When a requisition is bar-coded, radStation retrieves the patient's clinical information and automatically displays the prior comparison report. If the radiologist agrees with the prior report, a single click on a "quality assurance" agree box documents the agreement. In the case of a discordance, an additional dialog box automatically appears and the radiologist enters the reason for disagreement and then submits the case as a discrepancy. The system holds the discordance for 3 to 5 working days, then notifies the original radiologist via E-mail that a prior interpretation has been submitted for peer review, lists the submitted discrepancy reason, and provides a link to display the discordant report. The peer-review database is separate from the existing radiology information system (RIS). At the end of every month, summary reports of all peer-review activity are generated automatically. Initial benchmarks of our deployed system anticipate documentation of long-term random peer-review rate at greater than 50% of interpreted cases. The system enhances the peer-review process by integrating it with the normal interpretation workflow. The time to complete peer review using radStation is less than 1 second per normal case and less than 60 seconds for a discordant case. The E-mail notification system is fully automated, eliminating the need for secretarial involvement in the data collection. This system has completely replaced a manual paper-based system. The integration of peer review directly into the radiologist's interpretation workstation greatly enhances the capability to easily exceed JCAHO standards. The overall increase in peer-review documentation should continue to improve the ability to document a consistent high quality of patient care.

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RANDOM CASE PEER REVIEW OF prior radiologist's interpretations is mandated by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), which expects documentation of a 5% rate of random-case professional peer review. While the 5% benchmark may seem

minimal, countless hours are spent in departments enforcing peer-review requirements. The integration of the peer-review process into the radiologist's interpretation workflow was expected to increase the percentage of documented random peer review while decreasing documentation time and effort. We describe the implementation of radStation, a clinical review dictation system with integrated professional peer review as a core function. radStation is available for all interpreting radiologists, and it automates the peer-review process with minimal, if any, impact on a radiologist's workflow efficiency.

MATERIALS AND METHODS

This electronic peer-review system replaced a longstanding paper-based system. In the former system, radiologists would manually fill out a monthly peer-review sheet that recorded random reviews. Discordant cases would be identified either during the random peer review or at any time a discordant case was identified. For a discordant case, the peer-review radiologist requested a "card" be created by the transcriptionist, which was sent to the peer-review officer. The original dictating radiologist would receive a copy of this card as well.

The new peer-review system is a component of our in-house-developed radStation application.¹ A Dictaphone Boomerang microphone (Stratford, CT) is interfaced with a PC containing the radStation application, and replaces a dedicated dictation device. With input initiated via the integrated bar-code reader, the system electronically displays a prior comparison report. An agreement with the prior report is captured when pressing on the middle button of the dictation microphone. The microphone input initiates the creation of a Peer Review Agreement message that includes the prior report examination type, accession number, dictating radiologist, and current radiologist. The message is transferred to the central server using Microsoft (Redmond, WA) Message Queue and then entered into Microsoft SQL Server database application. Therefore, a click on a microphone button represents the time needed for recording an "agree" professional peer-review evaluation.

If a "discordant" case is identified, the radiologist must use

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the keyboard mouse to click on the disagreement button on the radStation screen. A dialog box appears on the lower part of the screen and the submitting interpreter enters the reason for the discordance (Fig 1). The message is created as for agreement cases and sent to the central server and stored in the quality assurance database. Five to 7 days later, an E-mail message notifies the initial interpreter of the discordant case. The delay in sending the E-mail message is designed to increase the confidentiality of peer-review submissions.

Monthly summary quality assurance reports are created from automated queries of the SQL database. At the end of each month, department section chiefs receive an E-mail message summarizing the number of agreement cases and listing discordant cases. The discordant cases are then reviewed to assess the severity of the quality assurance discordance.

The radStation application runs on a Windows NT (Microsoft) client computer and the server uses Windows NT server software. The SQL server application is deployed on a separate server than the radiology information system (RIS).

RESULTS

The system has significantly decreased the amount of time invested in random peer review while increasing our rate of random case review. The capability to perform random peer review in the context of interpreting the current examination is an efficient method. The system allows random peer review to occur with insignificant time needed to input cases. Depression of the middle button of the dictation system signifies agreement with the prior report. Radiologist training to use the system is included in the 5-minute training session for the entire radStation program.

DISCUSSION

The goal of the system was to increase the rate of documented professional peer review. It has the added benefit of increasing the efficiency of our discordant case review. While the standards of JCAHO require peer-review reporting of discordant cases, there is also a requirement for random review. In our prior system, likely used by other groups, a radiologist would complete a manual record to document the randomly reviewed cases. The form was as recommended by the American College of Radiology.² This documentation process interrupted case interpretation. In our own department, if each random review took approximately 1 minute, random peer review of 5% of 235,000 cases (11,700 cases) would represent almost 200 hours of radiologist time in documentation. This does not account for the secretarial time in accumulating the peer-review sheets. In some instances, radiologists would pull random cases to review during a separate session. This substantially increased the time needed for those radiologists to complete their random peer-review requirements.

The concept of computerization of the peer-review process is not novel. In a 1994 survey of the American College of Radiology, 28% of radiology departments had a computerized component of their quality assurance program.³ The efficiency of a computerized documentation program for maintaining quality assurance record has been identi-

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Accession or MRN: 123456- Smith, John Routine: 10

1940222 - CHEST, PA & LATERAL

Date	Rpt Loc	Resource Name	Activity Description
01/18/200...	DI A	DIAGNOSTIC IMAG...	CHEST, PA & LAT
01/18/200...	THORM...	HONG, WAUN K. ...	FOLLOW-UP, THORACIC MEDICINE

Radiology: Lab: Clinic Notes

Procedure	Date	Proc Nu.	Status
DSF CT CHEST WITH CONT...	12/17/1999 16...	1936561	+S
CHEST, PA & LATERAL	12/14/1999 10...	1940222	+S
CT, LUNG, MED, PLEURA W...	11/09/1999 11...	1900561	+S
CHEST, PA & LATERAL	11/09/1999 08...	1940222	+S
FSNPM4G1S, SWAI 1 (W/ CT)	10/05/1999 09...	1940567	+S

Quality Assurance
CHEST, PA & LATERAL 12/14/1999 10:16

Agree Send

CHEST, PA & LATERAL 12/14/1999 10:16
Reading Dr: 00495 Dr. Robert Jones Ordering Dr: 00807 HONG, W

Examination: Chest
Clinical History: Follow-up submandibular carcinoma with pulmonary metastases.

IMPRESSION: Stable left metastases.

FULL RESULT: Compared to 11/9/99 the metastatic disease involving the left chest, particularly the lower portion of the left base and along the left chest wall all appears about the same. The right lung remains clear

Comments for QA Disagreement
Developing metastasis right lung

Fig 1. Quality-assurance discordance entry. When a discordant case is identified, the dictating radiologist clicks on a disagree button and a comment box appears at the bottom of the screen. The reason for discordance submission is entered via keyboard and the "send" button forwards the discordant case information to the quality-assurance peer-review server.

fied.⁴ Frank et al described a computerized quality-assurance system in which the radiologist would capture discordant cases through bar-code inputs.⁵ The system was not entirely automated, as a secretary would transcribe the entered discordant reports. The system did not attempt to document random peer review, which is a main focus of the radStation system.

A current limitation of our system is its focus on the interpretation aspect of the examinations. Other quality-assurance measures, such as adherence to technical standards and appropriateness of examination ordering, are not addressed. However, the peer-review integration concepts could also be applied for radiologists to record these factors in the interpretation process. In an envisioned scenario, the system could notify the radiologist when technical factors need to be commented upon for a presented examination. The system would also provide for input of nonacceptable factors for any examination.

Peer review is an extremely sensitive topic and confidentiality must be maintained. Hospital-based radiologists typically are not directly employed by the hospital in which they practice. While RIS usually have a peer-review component available, it may not be used, especially given concerns of confidentiality. Peer-review data, if not appropriately protected, could potentially be misappropriated as a measure of competence of a given group to practice in a given hospital. These data could be used against a radiology group with the intention to displace the group from their hospital employment.

The current peer-review data are archived in a database that is completely separate from the RIS database. The radStation system architecture allows the peer-review database to reside anywhere on the internet. The current system implementation exists behind a firewall. If the peer-review server were to be located outside a firewall, then encryption of the message traffic would likely have to be considered.

We believe having a distinct database for peer review increases the legal protection of the data. In the state of Texas, professional peer-review activities are protected from legal discovery. However, if these data were maintained in an otherwise open RIS, it could potentially be argued that the system does not qualify for peer-review protection as the primary purpose of the RIS is clearly not to gather

peer-review data. A separate peer-review database negates this legal argument.

The use of E-mail for peer-review submission notification could be questioned as an inappropriate compromise of the confidentiality of the system. The E-mail message to the original radiologist clearly identifies the message as a quality-assurance discordance submission notification, which legally protects the message from discovery. The E-mail notification message only provides the original interpreting radiologist with a notification of possible discordance. Later review by a quality-assurance officer, section chief, or their designee determines the clinical significance of the quality-assurance submission.

When a discordant case is submitted, the radiologist submitting the case is withheld from the radiologist of record on the original case. The system delays the sending of the notification message in order to increase the anonymity of the case submitter. While the most likely submitter of the discrepancy is the interpreter of a follow-up examination, this is not assured. Any radiologist can submit a discrepancy using the system on any case. The submission radiologist is known only to the quality-assurance officer. The E-mail notification parallels the practice of our existing paper-based system of notifying a radiologist through an index card placed in the mailbox. In the prior system, it was expected that the radiologist would review all cases for which a card was generated. All cases in which an E-mail is received will be reviewed by the original interpreter.

CONCLUSIONS

We believe this system is applicable to many practice situations and could easily be incorporated into the RIS modules of most major vendors. As integrated clinical information management systems for radiologists become common place, we anticipate and encourage that similar systems be incorporated into the information flow of radiologists. This will increase the documentation of quality care delivery for a group of radiologists.

The integration of peer review directly into the radiologist's interpretation workstation greatly enhances the capability to easily exceed JCAHO standards. The overall increase in peer-review documentation should continue to improve the ability to document a consistent high quality of patient care.

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