SESSION II

Computerized Follow-Up of Discrepancies in Image Interpretation Between Emergency and Radiology Departments

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Radiographs are ordered and interpreted for immediate clinical decisions 24 hours a day by emergency physicians (EP's). The Joint Commission for Accreditation of Health Care Organizations requires that all these images be reviewed by radiologists and that there be some mechanism for quality improvement (QI) for discrepant readings. There must be a log of discrepancies and documentation of follow up activities, but this alone does not guarantee effective QI. Radiologists reviewing images from the previous day and night often must guess at the preliminary interpretation of the EP and whether follow up action is necessary. EP's may remain ignorant of the final reading and falsely assume the initial diagnosis and treatment were correct. Some hospitals use a paper system in which the EP writes a preliminary interpretation on the requisition slip, which will be available when the radiologist dictates the final reading. Some hospitals use a classification of discrepancies based on clinical import and urgency, and communicated to the EP on duty at the time of the official reading, but may not communicate discrepancies to the EP's who initial read the images. Our computerized radiology department and picture archiving and communications system have increased technologist and radiologist productivity, and decreased retakes and lost films. There are fewer face-to-face consultations of radiologists and clinicians, but more communication by telephone and electronic annotation of PACS images. We have integrated the QI process for emergency department (ED) images into the PACS, and gained advantages over the traditional discrepancy log. Requisitions including clinical indications are entered into the Hospital Information System and then appear on the PACS along with images and readings. The initial impression, time of review, and the initials of the EP are available to the radiologist dictating the official report. The radiologist decides if there is a discrepancy, and whether it is category I (potentially serious, needs immediate follow-up), category II (moderate risk, follow-up in one day), or category III (low risk, follow-up in several days). During the working day, the radiologist calls immediately for category I discrepancies. Those noted from the evening, night, or weekend

before are called to the EP the next morning. All discrepancies with the preliminary interpretation are communicated to the EP and are kept in a computerized log for review by a radiologist at a weekly ED teaching conference. This system has reduced the need for the radiologist to ask or guess what the impression was in the ED the night before. It has reduced the variability in recording of impressions by EP's, in communication back from radiologists, in the clinical follow-up made, and in the documentation of the whole QI process. This system ensures that EP's receive notification of their discrepant readings, and provides continuing education to all the EP's on interpreting images on their patients.

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THE USE of a hospital-wide Picture Archival and Communication System (PACS) has been associated with a wide variety of benefits including improved availability of images by radiologists and clinicians. However, this improved availability can prove to be a "double edged sword" in that there is an associated tendency toward a decreased rate of consultation with radiologists. This creates the potential for an increased rate of misdiagnoses by clinicians. This decreased rate of "in person" consultations with radiologists in areas such as the Emergency Department (ED) and the intensive care unit has been compensated by an increase in other forms of communication. These include an increased use of telephone consultations, electronic annotation of images by radiologists using the PACS, and the use of a digital dictation system as well as an increased number of scheduled teaching rounds and conferences.^{1,2}

The Emergency Department represents a particularly challenging area in a filmless and paperless environment for a number of reasons. One reason for this is the requirement for very rapid diagnoses for patients with acute or sub-acute, urgent disease processes.³ Another is the fact that a relatively large number of ED cases present during the late evening, night, or weekend hours. Given the fact that radiologists are not always available for immediate primary image interpretation 24 hours per day, 7 days per week, there is a tendency for EP's to render primary diagnoses themselves without prior

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consultation with the radiology department. These studies are subsequently interpreted, often the following morning, by radiologists who are often unaware of the preliminary diagnosis rendered by the emergency room staff. The radiologists consequently do not know when an erroneous positive diagnosis has been made in a patient who was, in fact, normal. Additionally, radiologists who make positive findings cannot be certain whether the EP's also made these findings. Consequently, the radiologists must assume that the correct findings were made, or that the radiology report will be read by the ED staff in a timely fashion, or alternatively must attempt to contact the emergency department each time a positive finding is made.

Some hospitals use a paper system in which the Emergency Physician writes a preliminary interpretation on the requisition slip, which will be available when the radiologist dictates the final report. In a paperless environment, this process of communication of the preliminary interpretation on the requisition does not take place and an alternative means must be utilized.

The Joint Commission for Accreditation of Health Care Organizations (JCAHO) stipulates that all of the Emergency Department images be reviewed by radiologists and that there be a mechanism for quality improvement (QI) for discrepant readings. This suggests that there should be a log of discrepancies and documentation of follow-up activities. There should also be a mechanism by which discrepancies are communicated not only to the Emergency Department staff on duty at the time of the discovery of the discrepancy, but that the emergency physician that initially diagnosed the image also receive feedback about the case as well.

In response to the clinical and JCAHO requirements and the difficulties presented in a paperless environment, we have integrated the QI process for emergency department images into the PACS, and gained advantages over the traditional paper based discrepancy log.

Clinicians utilize the Hospital Information System and Radiology Information System (HIS/RIS) to order all imaging studies. They enter the patient name, the study requested and the reason for the examination, which should include any pertinent historic information. The data is then communicated to the PACS using an HL-7 interface between the HIS/RIS and the PACS. The PACS workstations display this ordering information and the

requesting physician's name and the patient location in a window that occupies the lower third of the monitor.

The emergency physicians have been given the privilege to edit this window using the PACS workstations and to add their preliminary impression to the ordering information after preliminary review of the images. This is done for those examinations that have not yet been interpreted by the radiologists. In cases in which the radiologists have already read a study, the status of the exam is marked as "read" on the PACS. In these cases the emergency physician can retrieve the report via the telephone using the digital dictation system or if the report is transcribed already, can read the report from the PACS workstation.

The initial impression, time of review, and the initials of the emergency physician are available to the radiologist dictating the official report. The radiologist then decides if there is a discrepancy, and classifies it as category I, II, or III. A category I discrepancy is one that is potentially serious requiring immediate follow-up. A category II discrepancy implies moderate risk with follow-up needed in the next day or two. Finally, a category III discrepancy implies a low risk to the patient with follow-up not required for several days.

During the working day, the radiology department is expected to call immediately for category I discrepancies. Those noted from the evening, night, or weekend before are called to the emergency physician the next morning. All discrepancies with the preliminary interpretation are communicated to the Emergency Department and are kept in a computerized log for review by a radiologist at a weekly teaching conference.

This system has reduced the need for the radiologist to ask for or guess the impression that was rendered by the emergency physician. This has reduced the number of calls to the emergency department with positive findings that have already been made by the emergency physicians. It has also resulted in the ability of the radiologists to provide feedback to the EP's about "overcalls" in which an abnormality diagnosed by an EP was, in fact, not actually believed to be present by the radiologist. The system has also been able to identify diagnoses that were "missed" by the emergency room staff. In these cases the emergency physicians are provided with feedback and can determine the best course of action, if any, to take to follow-up these

patients. It has also reduced the variability in the recording of impressions by EP's in communication back from radiologists, in the clinical follow-up made, and in the documentation of the entire Quality Improvement process.

In conclusion, our experience with the use of the PACS to communicate preliminary impressions from emergency room physicians to radiologists and the status of exam dictations to the emergency department has been positive. The system ensures that emergency physicians receive notification of discrepant readings to improve the accuracy of the clinical decision making process and provides continuing education to all of the emergency room

physicians on image interpretation for their patients.

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