

Communication of Unexpected and Significant Findings on Chest Radiographs With an Automated PACS Alert System

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Purpose: An integral part of realizing the enormous potential of imaging in patient care is close communication between radiologists and referring physicians. One key element of this process is the communication of unexpected significant findings. The authors examined the performance of a PACS-based alert system in the appropriate communication of reports containing unexpected significant findings to referring physicians.

Methods: A PACS-integrated key word system was developed such that an e-mail was sent to the referring clinician if a radiologist detected a significant unexpected finding. The number, source, and outcome of chest radiographic unexpected findings over a 14-month period were analyzed. The time for response of the referring physician plus time for follow-up were also examined.

Results: Key words were applied to 158 of the 39,665 chest radiographs (0.4%) obtained during the study period. The emergency department was the most frequent referral location (46.2%). Final diagnostic categories included malignancy (13.9%), benign lesion (49.4%), and no abnormality (20.2%). The average time to acknowledgment by clinicians of notification was 3.1 days, although 57.6% were acknowledged within 24 hours. The mean time interval to the next relevant radiologic investigation was 26 days among the 77.8% of findings that underwent radiologic follow-up.

Conclusions: The development of electronic alert systems, which are integrated into PACS, can aid greatly in report communication and eliminate the risk associated with unread reports that contain significant or unexpected findings.

Key Words: PACS, chest radiograph, unexpected clinical findings, lung cancer, medicolegal risk

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INTRODUCTION

Increasingly, imaging plays a pivotal role in the diagnosis and management of many clinical conditions and also in monitoring response to treatment, along with the timely detection of complications related to treatment. The importance of imaging in decision making in clinical medicine is reflected in the exponential increase in the number of imaging studies performed annually at most

medical institutions worldwide [1]. An integral part of realizing the enormous potential of imaging in patient care is close communication between radiologists and referring physicians. This is to ensure appropriate choice and utilization of imaging studies plus accurate and timely interpretation and reporting of these studies to ensure that appropriate management is instituted as quickly as possible. An equally important part of this process is that the referring physician ensures that reports of all requested imaging studies are reviewed, correlated with the clinical picture and other diagnostic examinations, and discussed in a multidisciplinary setting when necessary, to ensure that appropriate management is instituted in a timely fashion. In recent times, the volume of such investigations has increased enormously, resulting in an additional administrative burden on referring clinicians to ensure that results and reports are reviewed and that appropriate actions are taken. The widespread use of PACS and radiology information systems (RIS) has improved the turnaround time of

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radiology reports and ensures that responsible radiologists report all imaging studies. The access to such reports has also significantly improved with improved access to radiology reports and capability for hard-copy reports.

Patient safety can be compromised by a failure of referring physicians to acknowledge and act on radiology reports and other test results within an appropriate time frame [2-4]. A major challenge to radiologists is the communication of unexpected or acute significant findings to referring physicians, as most PACS and RIS systems do not have established robust systems in place to identify these reports and ensure that they are communicated to referring physicians in an expeditious manner. The absence of such systems is a major concern for both referring physicians and radiologists, as delays in the communication of these acute or unexpected findings may prevent or delay appropriate management and can profoundly affect patient care. The World Alliance for Patient Safety has identified poor follow-up on test results as a major issue affecting safe patient care [5], increasing the risk for missed or delayed diagnoses. In the United States, failure to communicate abnormal radiologic results in an appropriately expeditious fashion is estimated to be the fourth most common cause of litigation against radiologists [6].

These issues have been extensively studied in an attempt to reduce the potential for delayed diagnosis and management. One of the outcomes of these studies is that radiologists can no longer assume that their duty of care has been discharged once the images have been reviewed and interpreted and the report has been finalized. The impact of poor communication on malpractice litigation is now a factor in up to 80% of all medical malpractice lawsuits. A quarter of all ACR members have been involved in malpractice lawsuits related to failures in communication, with subsequent high settlement awards to the injured parties [7,8].

Efforts to improve communications between radiologists and clinicians, using IT, are still in their infancy, with a lack of evidence of its effective use in practice [7,9-12].

The purpose of this study was to demonstrate the development and successful implementation of an automated PACS-based alert system, in a tertiary referral center, for the communication of unexpected and significant findings on chest radiography to referring physicians.

METHODS

This study was approved by the institutional research ethics committee. As part of our institution's radiology department quality assurance program, it was decided to prioritize the creation of a process to address the issue of timely identification and communication of imaging reports that contained unexpected and significant imaging findings (which could affect patient management) to referring physicians. The following PACS-based electronic system was developed. Briefly, if at the time of interpretation and dictation, using voice recognition,

of an imaging study, a radiologist noted a significant and unexpected finding (such as a lung nodule or mass suggestive of malignancy) requiring action or intervention by the referring physician, the key word "unexpected and significant clinical findings" was created and enabled in the institutional PACS (Agfa Impax version 6.0; Agfa, Morstel, Belgium), which initiated an immediate communication or alert sequence via e-mail or text message from the radiology department to the referring physician. Findings that were significant but not unexpected, such as progression of disease in an oncology patient with known metastatic disease, did not have the key word applied. It should be highlighted that this sequence did not replace the requirement of the radiologist to communicate with the physician by telephone in the event of emergency cases that required immediate intervention. In addition, this system is not intended to replace standard report transmission and verification.

Process

When unexpected or significant imaging findings were identified on an imaging study, the radiologist activated the alert system by selecting the appropriate key word, "unexpected and significant clinical findings," from a dedicated drop-down menu within the PACS after, or during, the creation of a report. By selecting the key word, the report or event was tagged with this key word in the PACS. A list of reports and events tagged with the "unexpected and significant clinical findings" key word was created twice daily by a RIS administrator, who then contacted the referring physicians by e-mail. The referring clinicians were requested to respond to the RIS administrator confirming acknowledgment of the e-mail and awareness of the report findings. In the event of a delay occurring with a response from a referring clinician, repeat e-mails were issued to the referring clinician or members of the clinical team until a response was forthcoming. Any outstanding alerts not responded to were discussed at the weekly radiology department quality assurance meeting, and the radiologist was then asked to make telephone contact with the referring physician. The process is outlined in Figure 1. Because of the well-recognized risk associated with delayed communication of findings relating to lung nodules and masses on chest radiographs, particularly in asymptomatic patients, when such a finding was identified by a radiologist on chest radiography, an e-mail was also forwarded to a clinical nurse specialist in the regional cancer control office.

Study Design

The aim of this study was to investigate the effectiveness of the process described previously for the timely communication of significant and unexpected findings to referring physicians. For the purpose of this study, we limited our audit to significant and unexpected findings

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