ORIGINAL ARTICLE

Critical Findings: Attempts at Reducing Notification Errors

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Abstract

Purpose: Ineffective communication of critical findings (CFs) is a patient safety issue. The aim of this study was to assess whether a feedback program for faculty members failing to correctly report CFs would lead to improved compliance.

Methods: Fifty randomly selected reports were reviewed by the chief of neuroradiology each month for 42 months. Errors included (1) not calling for a CF, (2) not identifying a CF as such, (3) mischaracterizing non-CFs as CFs, and (4) calling for non-CFs. The number of appropriately handled and mishandled reports in each month was recorded. The trend of error reduction after the division chief provided feedback in the subsequent months was evaluated, and the equality of time interval between errors was tested.

Results: Among 2,100 reports, 49 (2.3%) were handled inappropriately. Among non-CF reports, 98.97% (1,817 of 1,836) were appropriately not called and not flagged, and 88.64% (234 of 264) of CF reports were called and flagged appropriately. The error rate during the 11th through 32nd months of review (1.28%) was significantly lower than the error rate in the first 10 months of review (3.98%) ($P = .001$). This benefit lasted for 21 months.

Conclusions: Review and giving feedback to radiologists increased their compliance with the CF protocol and decreased deviations from standard operating procedures for about 2 years (from month 10 to month 32). Developing new ideas for improving CF policy compliance may be required at 2- to 3-year intervals to provide continuous quality improvement.

Key Words: Critical findings, notification, quality improvement, communication

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INTRODUCTION

Reduction in medical errors leading to subsequent improvement in patient health has received widespread attention since the Institute of Medicine's report on the impact of these errors on patients' well-being [1] and the high financial burden to the health care system [2]. One of the leading causes of error-induced patient harm is ineffective communication among physicians.

The ACR has tried to address communication errors in diagnostic imaging through the dissemination of practice parameters on communication [3]. This document includes a detailed section describing situations defined as nonroutine communications (2.C.2) with regard to critical abnormal findings. Such timely notification of critical radiologic test results has been included in the National Patient Safety Goals by The Joint Commission since 2011 [4].

To achieve this goal, there is a fundamental necessity to define critical findings (CFs) in radiologic results. In the absence of a national written standard for CFs, each institution is expected to specify its own radiologic CFs for prompt and direct communication to referring clinicians. At our institution, a list of critical test results was formed and approved in collaboration with the neuroradiology, neurosurgery, neurology, and otorhinolaryngology services.

Mismanagement of these CF test results could result in harm to patients. We have defined, as part of a practice quality improvement initiative, a CF "error" to be one in which (1) notification of a clinician is not performed in the presence of a CF, (2) a CF is not labeled as critical, (3) a non-CF is labeled as critical, and (4) a physician is called with a "CF" that is really not critical. The first two errors are important with respect to providing patients the

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immediate care they need. Although we do not wish to discourage physician-to-physician communication, the latter two were labeled as errors because unessential immediate communication with physicians in the absence of CFs might unnecessarily interfere with radiologists' and clinicians' workflow and leads to workplace inefficiency.

In this study we examined the impact of monthly notifications of neuroradiologists about deviations in their compliance with our CF protocol. We sought to determine if such feedback would lead to reductions in divergences from the standard operating procedures (SOP) for CFs. Moreover, we evaluated how long the influence of such feedback would last. We hypothesized that receiving negative feedback and education about the appropriate use of the CF protocol would have a lasting (>1 year) improvement in physicians' compliance with that protocol, leading to reduced discrepancies from the standard.

METHODS

This study was approved by the institutional review board and was deemed to be HIPAA compliant as part of a quality improvement initiative. Informed consent for the review of patient records was waived.

In 2004, a list of CFs was generated in the neuroradiology division of our institution to specify radiologic abnormalities that require immediate direct communication with the referring physician. Afterward, the list was approved by neuroradiology, neurosurgery, neurology, and otorhinolaryngology departments. Furthermore, it has been revised at 5-year intervals. This revised list includes 17 critical neuroradiologic conditions (Table 1). Thereafter, the list was posted as a reference for all health care providers in the division of neuroradiology. A copy of the list is available at each workstation to simplify accessibility for the radiologists.

In the presence of a CF in a report, radiologists were educated to apply a CF macro in the speech recognition dictation software program that read THIS REPORT CONTAINS FINDINGS THAT MAY BE CRITICAL TO PATIENT CARE. The findings were discussed with (referring provider's name) at (time) hours on (date). FLAG: (C). Accordingly, the time and date of communication were to be recorded for each CF.

Each month from November 2012 through April 2016, 50 reports from the neuroradiology division of our large (>1,000-bed) academic hospital were randomly selected by an IT clerk. In total, 2,100 reports from 18 radiologists were included in the study. Each report contained the patient name, medical report number, date and time of the report, and type of examination.

Table 1. List of critical findings

I. New or enlarging hemorrhage in the unoperated brain (epidural, subdural, intraparenchymal,subarachnoid, intraventricular, intramedullary)
II. New stroke
III. New mass, markedly enlarging mass
IV. New or worsening herniation
V. Increased intracranial pressure, brain edema
VI. New or worsening hydrocephalus
VII. Misplaced or malfunctioning surgical hardware (including fixation devices, catheters, clips, coils)
VIII. Acute fracture (skull, spine, critical facial bones)
IX. Findings suggestive of meningitis or abscess cerebritis, (cranial) osteomyelitis
X. Airway compromise
XI. Globe/retina/optic nerve compromise
XII. Findings suggestive of child abuse
XIII. Vascular abnormality: aneurysm, AVM, dissection, critical stenoses, dural venous thrombosis, incorrectly clipped vessel
XIV. New cord/cauda equina compression
XV. Suspected cord infarction
XVI. Findings of spinal instability in a trauma patient (including osseous and ligamentous injury)
XVII. Congenital variations that may alter a surgical approach

Note: AVM = arteriovenous malformation.

These reports were reviewed by the division chief of neuroradiology. If a report contained a CF but had not been flagged as critical or had not been called to the referring physician by the radiologist, or if a report that did not contain a CF had been flagged as critical or had been called as such, it was classified as an SOP error in our study. Afterward, the division chief e-mailed the radiologist who had made the error about the CF mismanagement with the report and an explanation as to why that notification or flagging was inappropriate.

We recorded the number of appropriately handled and mishandled reports of radiologists in each month. Then we evaluated if the rate of errors decreased after the division chief provided feedback in the subsequent months.

Frequency tables with χ^2 and trend tests were used in comparing the error rates. The nonparametric K-sample median test was used to test the equality of the time interval between error notifications. A multivariate mixed-effect Poisson model was used to evaluate the trend of monthly error reduction over the period of review, adjusted for number of reports with CFs and within-person variation in number of errors. Statistical significance was defined at $P < .05$. All analyses were done using Stata version 12 (StataCorp LP, College Station, Texas).