ORIGINAL ARTICLE

Random Versus Nonrandom Peer Review: A Case for More Meaningful Peer Review

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Abstract

Objective: Random peer review programs are not optimized to discover cases with diagnostic error and thus have inherent limitations with respect to educational and quality improvement value. Nonrandom peer review offers an alternative approach in which diagnostic error cases are targeted for collection during routine clinical practice. The objective of this study was to compare error cases identified through random and nonrandom peer review approaches at an academic center.

Methods: During the 1-year study period, the number of discrepancy cases and score of discrepancy were determined from each approach.

Results: The nonrandom peer review process collected 190 cases, of which 60 were scored as 2 (minor discrepancy), 94 as 3 (significant discrepancy), and 36 as 4 (major discrepancy). In the random peer review process, 1,690 cases were reviewed, of which 1,646 were scored as 1 (no discrepancy), 44 were scored as 2 (minor discrepancy), and none were scored as 3 or 4. Several teaching lessons and quality improvement measures were developed as a result of analysis of error cases collected through the nonrandom peer review process.

Conclusions: Our experience supports the implementation of nonrandom peer review as a replacement to random peer review, with nonrandom peer review serving as a more effective method for collecting diagnostic error cases with educational and quality improvement value.

Key Words: Diagnostic error, peer learning, discrepancy, peer review, random, nonrandom, practice improvement

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INTRODUCTION

Diagnostic error in imaging is prevalent, with reported error rates generally ranging from 3% to 37% [1-7]. The factors contributing to diagnostic error are numerous and can include latent conditions, active system failures, and individual factors that may reflect various human cognitive biases. Despite research on diagnostic error in radiology dating as far back as the 1940s, there has been a disappointing lack of progress in effective strategies to reduce or mitigate the negative impact of radiological errors [8].

One of the primary tools proposed to reduce diagnostic errors is peer review, in which radiologists review the interpretations of other radiologists to determine if an error was made. The ACR's RADPEER program is the most commonly used method of peer review in the United States [9]. Although RADPEER is designed to be easy and efficient to use, there are significant issues that limit RADPEER from achieving the intended goal of performance improvement and peer learning. These issues include poor interrater reliability, lack of blinding, and random case sampling that requires a significant number of cases to be reviewed to detect error cases [10,11].

Nonrandom peer review processes can be designed to identify cases with educational or performance improvement value without many of the limitations associated with RADPEER and other random peer review processes. Cases can be identified through routine clinical work, consultation with referring providers, multidisciplinary conferences and tumor boards, and patient-reported methods. Developing a process to collect cases of diagnostic error through these various routes has the potential to substantially increase the number of educational error cases and provides opportunities to identify patterns

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among these cases that is otherwise not possible through random peer review processes.

The purpose of this study is to compare the educational and performance improvement value of diagnostic radiology error cases identified through random versus nonrandom peer review processes among the same cohort of subspecialty-trained abdominal imaging radiologists during a 1-year period at an academic tertiary care medical center.

METHODS

This quality improvement project was exempt from Institutional Review Board. Cases with diagnostic error interpreted by 10 radiologists in the abdominal imaging section of an academic radiology department were collected from July 1, 2016, through June 30, 2017. Nine of the radiologists are subspecialty trained in abdominal imaging with experience ranging from less than 1 year to more than 30 years. One radiologist is subspecialty trained in interventional radiology but has greater than 10 years of diagnostic abdominal imaging experience. Modalities included radiography (x-ray), ultrasound, CT, and MRI.

Random Peer Review

Our random peer review process is modeled after RADPEER and was in place throughout the 1-year study period. All radiologists in our department are required to review 20 random cases per month through a custom Epic (Epic Systems Corporation, Verona, Wisconsin, USA) module using a rating system displayed in Table 1. Cases rated as 3 or 4 are reviewed by the departmental quality officer and sent to the interpreting radiologist for review, similar to RADPEER. When there is disagreement about the score, the case is sent to the division chief for adjudication. A report can be generated through Epic that provides the medical record number, accession number, date and time of the examination, interpreting radiologist, reviewing or scoring radiologist, and comment when available. Comments are only required for scores of 3 or 4.

Table 1. Rating system used for the internal random peer review process

Grade	Discrepancy	Impact
1	No discrepancy	
2	Minor discrepancy	Incidental to treatment
3	Significant discrepancy	May affect treatment of management, *not* outcome
4	Major discrepancy	May affect outcome

Nonrandom Peer Review

At the beginning of the study period, a nonrandom peer review process was initiated in the abdominal imaging section by one of the authors (J.N.I.), with the stated goal of accruing and learning from diagnostic error cases to inform quality improvement efforts. Radiologists were instructed to submit cases with diagnostic errors they encountered during routine clinical practice (ie, readouts, clinician consultations, or multidisciplinary conferences) to the author. Cases were subsequently presented and analyzed anonymously during a newly implemented and recurring peer learning conference (PLC) in the abdominal imaging section. The purpose of this conference was to analyze peer-reviewed error cases and identify underlying causes of the errors to inform practice quality improvement (PQI) efforts. We utilized best practices, including anonymizing cases in the PACS, providing relevant clinical information and prior imaging with each case (only information that was available to the original radiologist at the time of interpretation), and creating an anonymous survey using SurveyMonkey (Ottawa, Ontario, Canada) for radiologists to review the cases and submit blinded interpretations before the PLC. Each case was reviewed and discussed in a blinded manner, with follow-up imaging, surgery, and pathology results provided when available.

Analysis of Cases

Abdominal imaging cases identified through the random and nonrandom peer processes were reviewed by one of the authors (J.N.I.), who has more than 5 years of dedicated experience in abdominal imaging and more than 10 years of experience with diagnostic error. For each case, all relevant current and prior imaging, surgical reports, pathology results, clinical notes, laboratory values, and outside imaging and reports were reviewed to ensure that there was a diagnostic error. Cases accrued from the random peer review were already assigned a grade 1 to 4 (Table 1) by the reviewing radiologist, and those cases scoring 2, 3, or 4 were re-reviewed by J.N.I. to confirm the original grade assignment and reassign the grade if needed. All cases accrued through the nonrandom peer review process were assigned a grade 1 to 4 by J.N.I.

Error cases were classified by organ system and disease category. Cases were also categorized as either "perceptual"