

The Clinical Impact of Resident-attending Discrepancies in On-call Radiology Reporting: A Retrospective Assessment

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Abbreviations

MCR	management change rate
CT	computed tomography
MRI	magnetic resonance imaging
ED	emergency department
CR	computed radiography

Rationale and Objectives: The purpose of this study is to quantify the clinical impact of resident-attending discrepancies at a tertiary referral academic radiology residency program by assessing rates of intervention, discrepancy confirmation, recall rate, and management change rate; furthermore, a discrepancy categorization system will be assessed.

Materials and Methods: Retrospective review of the records was performed for $n = 1482$ discrepancies that occurred in the 17-month study period to assess the clinical impact of discrepancies. Discrepancies were grouped according to a previously published classification system. Management changes were recorded and grouped by severity. The recall rate was estimated for discharged patients. Any confirmatory testing was reviewed to evaluate the accuracy of the discrepant report. Categorical variables were compared to the chi-square test.

Results: The 1482 discrepancies led to management change in 661 cases (44.6%). The most common management change was follow-up imaging. Procedural interventions including surgery occurred in 50 cases (3.3%). The recall rate was 2.6%. Management changes were more severe with computed tomography examinations, inpatients, and when the discrepancy was in the chest and abdomen subspecialty. Also, management changes correlated with the discrepancy category assigned by the attending at the time of review.

Conclusions: Resident-attending discrepancies do cause management changes in 44.6% of discrepancies (0.62% overall); the most frequent change is follow-up imaging. The discrepancy categorization assigned by the attending correlated with the severity of management change.

Key Words: Resident; discrepancy; on-call.

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RATIONALE AND OBJECTIVES

A fundamental concept in radiology residency training is the development of independence in a paradigm of graded responsibility. In the past, residents obtained this experience working nights for the practice in which their residency was embedded. Although this model persists in many departments, there is an increasing drive to a 24-hour coverage model with an attending radiologist, even subspecialty radiologist, providing direct resident supervision and final signing throughout the night. This model poses a challenge

to fostering independence in residency, particularly in the early years of training.

One of the strongest arguments for the 24-hour attending coverage is the need to avoid resident-attending discrepancies that lead to significant changes in management, particularly for discharged or critically ill patients. Although this justification is inherently reasonable, it is easy to overemphasize its importance when the true impact of discrepancies is not well defined. Previous studies have determined what the discrepancy rates are in several resident practice environments (1–3). Others have shown that discrepancy rates are correlated with duration of shift (4) and vary with different imaging study types (5,6).

Fewer studies have specifically detailed the clinical impact of discrepancies (7–9). Ruchman et al. reviewed 11,903 reports with a discrepancy rate of 24% and showed no significant effect on management in 92.8% of discrepancies. It should be noted, however, that this group did not specifically detail their criteria for assessing management impact. The definition of discrepancy

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has been reasonably well defined (5,7,9,10), yet several studies apply different criteria which makes direct comparisons challenging (8,11). A paper by Friedman et al. identified a low rate of 28 per 18,185 reports as discrepant. They relied on chart review and emergency department (ED) physicians' assessment to assess discrepancy impact, but did not include cases where follow-up imaging was pursued as having a change in management. In a study of computed tomography (CT) angiography of head and neck, Meyer et al. described only one case where a change in management occurred out of 73 discrepancies, yet there is ambiguity over whether follow-up angiograms after negative computed tomography angiography was performed as a result of the discrepancy or not (11).

Other studies suffer from small numbers or limited imaging of patient subgroups. Bruni et al. performed a rigorous retrospective analysis of discrepancies, but limited their analysis to neuroradiology studies (9). The studies by Carney et al. and Filippi et al. had low numbers overall (35 discrepancies and 26 discrepancies, respectively), and little detail on management changes were provided (5,10). The study by Tieng et al. had low numbers (20 discrepancies out of 203 studies) and defined minor discrepancies as conditions that would not impact the course of ED management, potentially excluding cases with clinically impactful discrepancies (3).

The purpose of this study is to quantify the clinical impact of resident-attending discrepancies at a tertiary referral academic radiology residency program. Metrics estimated to address this question include rates of intervention, rates of confirmation of the discrepancy, the recall rate for discharged patients, and the management change rate (MCR). In addition, a previously proposed discrepancy classification system will be evaluated based on the severity of management change.

MATERIALS AND METHODS

Case Selection

The institution ethics review board granted approval for this retrospective study. The electronic discrepancy log was queried over a 17-month range from mid-January 2013 to mid-June 2014. Discrepant reports were generated for studies read by residents during the on-call period, all nights from 5 PM to 7 AM, from 12 PM to 5 PM on Saturdays, and all day Sunday and holidays. The attending that reviewed cases at the end of the call period determined the necessity of a discrepancy and supervised the electronic logging of the discrepancy by the resident into the radiology information system. Each discrepancy was recorded and categorized based on a previously published severity and location-based system (12). According to this system, only discrepancies with the potential to alter patient management were recorded, analogous to "major discrepancies" in other grading systems (4,5,9) or the "b" modifier in the RADPEER system (13). Studies' modality, discrepant diagnosis, times of the preliminary and addended reports, and interpreting attending subspecialty were recorded. At the study institution, residents do not read magnetic resonance

imaging (MRI) studies on call; hence, the vast majority of discrepant reports were for radiographs and CTs. The few non-radiograph and non-CT discrepancies ($n = 14$), such as ultrasound and nuclear medicine studies, were excluded from analysis due to small numbers.

Discrepancy Analysis

The patients associated with each discrepancy were identified and their charts were reviewed retrospectively. The diagnosis in question was recorded (including when a discrepancy occurred to call a study normal, a false-positive diagnosis) and categorized by organ system. The type of error that led to the discrepancy was grouped into observation (eg, failure to observe a significant finding, false negative) or interpretation errors (eg, misinterpretation of the significance of an observed finding). Several discrepancies were made that were categorized as report clarification errors (eg, an addendum made to change a follow-up recommendation, clarify a typographic or dictation error, or document a verbal communication that had already taken place with no change to the meaning of the preliminary report). These discrepancies were excluded from analysis as they represent errors that may be expected to occur if the attending were to have dictated the study by him- or herself or were erroneously entered as discrepancies (eg, the change to the report never had the potential to alter management). No communication errors had clinical impact. If several discrepancies occurred for a given report, all were recorded. For analysis in this study, the one discrepancy per report with greatest clinical impact was selected.

Clinical notes from the ED visit or admission were reviewed and changes in management attributed in writing to the discrepant report were identified and recorded. If no change in management occurred after the time of the discrepant report addendum and direct verbal communication, the discrepancy was considered to have no change in management even in the absence of a statement confirming the lack of change. Similarly, if a follow-up test was recommended and performed, it was assumed this occurred as a result of the discrepant report. If several clinical impacts occurred potentially as a result of the discrepant report, the most severe one was selected. For example, if a missed hip fracture on radiograph led to repeat imaging and then surgery, the clinical impact of the discrepancy was coded as therapeutic intervention (surgery). Changes in management were categorized based on a scheme (Table 1) and grouped by severity. To minimize variation in chart reviews, all charts were reviewed by one reviewer to standardize the assessment.

The initial discrepant and subsequent imaging studies performed of the same body region were reviewed in addition to other potentially confirmatory testing (laboratory, pathology) to assess the veracity of the attending-directed discrepancy. Patients that returned to the ED as a result of the report discrepancy and subsequent telephone call were identified and the recall rate was estimated. Time of preliminary and discrepant reports were identified, and delay to discrepancy was calculated.

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