The "Night Stalker" Effect: Are Quality Improvements with a Dedicated Night Call Rotation Sustained?

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The authors assessed whether the addition of a second-year diagnostic radiology resident assigned to cover the night shift at a major urban university hospital has a sustained effect on the number and clinical significance of "missed" radiologic findings. Radiographs interpreted overnight in the emergency department by radiology residents between January 1992 and December 1992 were reviewed daily by emergency radiology attending staff. A list of patients for whom there was a modification in the final radiologic interpretation was given to the emergency department physicians, who reviewed each case, scored the urgency of patient recall, and estimated the likelihood of patient morbidity attributable to the miss. The relative performance of after-hours residents was compared on the five nights per week with the dedicated night resident vs. the two nights per week without the dedicated night resident (control group).

Of 22,295 after-hours examinations performed during the study period, 304 (1.36%) misses were recorded, nearly identical to the miss rate for the preceding 6 months. The percentage per examination interpreted (and number) of missed cases stratified by recall score for the control and dedicated night resident groups, respectively, were: (a) immediate, 0.62% (34) and 0.29% (49); (b) within 48 hours, 0.31% (17) and 0.32% (54); (c) no recall, 0.71% (24) and 0.29% (39); (d) finding already recognized by emergency department physicians, 0.44% (24) and 0.23% (39); total, 2.09% (114) and 1.13% (190). The difference in total discordance rates is statistically significant (P < 1 x 10^-15). Our previously reported improvement in the quality of after-hours radiographic interpretation due to the addition of a dedicated night shift resident is sustained in a new group of residents. This confirms that the improvement is real and not a manifestation of the measurement methods.

In 1991, we added a dedicated night call resident ("night stalker") to our after-hours call coverage in a busy emergency department affiliated with our level 1 trauma center. Because of the design of our "night stalker" rotation, we were able to test the effect of having a dedicated second-year diagnostic radiology resident on duty five nights per week compared to the night coverage provided under a traditional call rotation on the other two nights per week. Our first analysis reported an overall discordance rate of 1.5% between radiology residents and the attending radiologists at the end-of-shift review the next morning (1). On nights when the "night stalker" was present, there were significantly fewer discordances overall and fewer requiring recall to the emergency department, compared to nights when no "night stalker" was on duty (control group). Patient morbidity scores were not significantly different between the groups. The three goals of our current study are to determine whether: (a) the improvement demonstrated by the addition of the "night stalker" is a sustained effect rather than a manifestation of other factors, such as the act of carefully observing resident performance (Hawthorne effect); (b) the immersion in emergency radiology experienced during the "night stalker" and emergency radiology day rotations provides any sustained performance benefit when a graduate returns to the general call pool; and
Materials and Methods

We used an existing quality assurance tool to determine the outcomes associated with radiographic misses made during after-hours emergency radiology coverage by diagnostic radiology residents. All cases in which the residents' initial and the attending radiologists' final radiologic opinions differed were considered discordant cases (misses) and were the proband data of this study. Our analysis was designed as a cohort study of these discordant cases, comparing performance on nights when a "night stalker" was present vs. nights when no "night stalker" was present (control) during the 1992 calendar year (current study) and July to December 1991 (previous study (1)).

Our emergency department has 33 patient treatment stations and is part of a level I trauma center in a 1200-bed urban university hospital. The emergency department is staffed continuously with a pool of attending board-certified emergency department physicians and rotating residents from internal medicine and surgery. Radiology examinations, including plain radiography, computed tomography, and ultrasound examinations, are performed in a four-room suite within the emergency department. In 1992, 38,774 conventional radiographic examinations were performed in the emergency department. Seventy-three percent of these imaging studies were performed after hours and were interpreted provisionally by on-call diagnostic radiology residents. Emergency department attending physicians or residents routinely reviewed their patients' radiographs while the patient was in the emergency department. Final reading of the examinations was made the next morning by one of nine attending board-certified diagnostic radiologists.

The dedicated night shift emergency room rotation ("night stalker" rotation) supplemented traditional after-hours coverage and did not replace traditional call. The traditional call team consists of a junior call resident who is in the last 3 months of the first year or the first 9 months of the second year and a senior call resident who is in the last 3 months of the second year, the third year, or the first 6 months of the fourth year of radiology residency. These traditional call residents provide coverage from 5:00 PM to 8:00 AM Monday through Friday, from 12:00 noon Saturday to 9:00 AM Sunday, and from 9:00 AM Sunday to 8:00 AM Monday morning. The "night stalker" rotation was initiated in July 1991 without changes in schedule through 1992. It is a 4-week rotation providing coverage Saturday through Wednesday nights from 11:00 PM to 8:00 AM. It is staffed by a second-year diagnostic radiology resident who has no daytime responsibilities. The nights when no "night stalker" is present (control group) include Thursday and Friday nights and holidays. The "night stalker" covers all other nights. Thus, the traditional (control) call team consists of a junior and a senior call resident. The "night stalker" call team consists of the junior and senior call residents plus the "night stalker," who is generally at the same level of training as the junior call resident. Although the "night stalker" team is larger, the average level of experience is less than the control team.

Some changes in attending staffing occurred between 1991 and 1992. There were major changes in the attending emergency department physicians, with departure of approximately half of the original group of physicians and hiring of several new staff members. Few changes occurred in the attending radiologist coverage but included departure one of the authors (F. A. M.) in the last quarter of 1992.

Measurements

Number of discordant cases

Every discordant opinion leading to modification of the provisional report was recorded on a quality assurance log. This tabular form included the review date, attending radiologist and emergency department physician names, the names of the residents on call, patient demographic information, type of examination, and the revised opinion. This form was given to the attending emergency department physician by the attending radiologist each day.

Recall action code

For each discordant case, the emergency department physician reviewed the patient’s medical record and determined whether modifications in the patient’s treatment were warranted. The emergency department physician assigned a recall action code (1 = immediate recall, 2 = recall within 48 hours, 3 = no recall necessary, 4 = the abnormality was noted by clinicians but not by the radiology resident during the initial patient visit and would have been code 1 or 2 if missed). In some cases, the quality assurance form was missing or incomplete. Data for those shifts were excluded from further analysis. Thus, of 28,173 examinations performed during the study, 22,295 could be used for analysis.

Outcomes

As in our previous study (1), an outcome code was assigned by the attending emergency department physician after patient follow-up (A = definite morbidity, B = possible morbidity, C = no morbidity). The changes in the emergency department physician pool present two problems in the outcome score. First, in a few cases, the new attending physicians omitted the outcome score, perhaps because of the additional time required to make an accurate outcome code assignment after patient follow-up. Second, assigning definite vs. possible vs. no morbidity is a highly subjective determination likely to be influenced by individual biases, whereas a decision to recall a patient is an all-or-none response that is less subject to individual variations. Given the change in composition of the emergency department physician pool, we question the comparability of outcome scores between the 1991 and 1992 cohorts. For these reasons, the more reliable recall action code was used to compare "night stalker" vs. control performance. The outcome code data were used for an analysis of morbidity associated with discordant cases using the assumption that all uncoded cases were category C. This assumption tends to diminish the positive contributions made by the "overreads" by attending radiologists of the after-hours cases (i.e., it would imply that misses found by attending radiologists are clinically unimportant). From the experimental design perspective, we believe that this is the conservative approach to dealing with these uncoded cases.

Statistical analysis

A goodness-of-fit chi-square statistic was used to determine the statistical significance of differences between the study groups for