ORIGINAL ARTICLE

The Effect of Faster Reporting Speed for Imaging Studies on the Number of Misses and Interpretation Errors: A Pilot Study

SA-CME

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Abstract

Purpose: The purpose of the study was to determine if increasing radiologist reading speed results in more misses and interpretation errors.

Methods: We selected a sample set of 53 abdomen-pelvis CT scans of variable complexity performed at a teaching hospital during the study period. We classified the CT scans into 4 categories based on their level of difficulty, with level 4 representing the most-complex cases. Five attending radiologists participated in the study. We initially established an average baseline reporting time for each radiologist. Radiologists were randomly assigned a set of 12 studies, of varying complexity, to dictate at their normal speed, and a separate set of 12 studies, of similar complexity, to read at a speed that was twice as fast as their normal speed. The major and minor misses were recorded and analyzed. A χ^2 analysis was used to compare the results.

Results: Reading at the faster speed resulted in more major misses for 4 of the 5 radiologists. The total number of major misses for the 5 radiologists, when they reported at the faster speed, was 16 of 60 reported cases, versus 6 of 60 reported cases at normal speed; $P = .032$. The average interpretation error rate of major misses among the 5 radiologists reporting at the faster speed was 26.6%, compared with 10% at normal speed.

Conclusions: Our pilot study found a significant positive correlation between faster reading speed and the number of major misses and interpretation errors.

Key Words: Faster reporting speed, abdomen and pelvis CT, major misses, interpretation errors

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INTRODUCTION

As the utilization of diagnostic imaging has continued to increase in recent years, the workload of radiologists has correspondingly risen. In 2006–2007, the average number of studies read annually by a radiologist increased by 7%, compared with 2002–2003 [1]. In 2006–2007, the annual relative value units (RVUs) per full-time equivalent (FTE) radiologist increased by 10%, compared with 2002–2003, and by 70%, compared with 1991–1992 [1]. Radiologists are under pressure to increase productivity by increasing workload volume. Studies have shown that a decrease occurs in both the accuracy of radiologic interpretation and the detection of pathology as the volume of interpreted studies increases and the viewing time per study decreases [2-4]. The purpose of this pilot study is to determine if faster reporting speed, for radiologists reading abdomen-pelvis CT imaging studies, results in more misses and interpretation errors.

Methods

This study was approved by the local institutional review board and was HIPAA compliant. Five board-certified attending radiologists volunteered to participate in the study, which was conducted at a tertiary-care teaching hospital. We used attending radiologists to eliminate inexperience as a factor in the results. The 5 radiologists had completed their fellowships in various subspecialties: 1 each in neuroradiology, interventional radiology,

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musculoskeletal imaging, body imaging, and women's imaging and ultrasound. The specialist in women's imaging and ultrasound has >15 years of experience; the neuroradiologist and the interventional radiologist have >10 years of experience; the body radiologist has >5 years of experience; and the musculoskeletal radiologist has 2 years of experience.

The body radiologist reads abdomen-pelvis CTs more often on the daily reading room schedule. The body radiologist, however, works part time and does not take calls. The other radiologists read abdomen-pelvis CTs on a daily basis, and they perform on-call readings as part of their responsibilities. Therefore, all the radiologists participating in the study read a substantial number of abdomen-pelvis CTs annually.

For this study, we selected a sample set of abdomen-pelvis CT scans, which included outpatient and inpatient studies performed at our institution between November 2013 and February 2014. The set consisted of a total of 53 noncontrast or contrast-enhanced abdomen-pelvis CTs of variable complexity, each categorized into 1 of 4 levels of complexity. A board-certified radiologist who had completed a fellowship in body imaging and had >25 years of experience selected the studies to be included in the sample set, and the level of complexity assigned to each examination.

Level 1 included noncontrast CTs with normal or noncomplex findings, without a prior comparison examination. Normal examinations were included to assess whether faster interpretation would lead to a greater rate of false positives, which could result in unnecessary and inappropriate treatment recommendations. Level 2 included contrast-enhanced CTs with no complex findings and without prior comparison. Level 3 consisted of contrast-enhanced and noncontrast CTs of moderate complexity that required comparison with prior studies. Level 4 consisted of contrast-enhanced and noncontrast CTs with significant complex findings that required comparison with prior studies.

Complex findings included entities such as postoperative states, known malignancies, free air, intra-abdominal abscess, recurrent neoplasm, and metastatic disease. Some of the sample studies (level-3 and level-4 studies) had prior studies available (eg, body CTs, MRI, or ultrasound), and required comparison to the older examinations for accurate interpretation.

We limited the study sample to CT scans of the abdomen and pelvis. These studies are among the exams most frequently ordered and interpretation errors may have a significant impact on patient care. CT scans of the abdomen and pelvis are the most common examinations performed in our department and are interpreted on a daily basis by all staff radiologists regardless of fellowship training. All the selected sample studies were previously read and had final reports available; however, the reporting times of the original interpretation were not recorded, making it difficult to use the original studies and their miss rate as a real-life control. Each of the radiologists established a baseline, average reading speed by direct, self-measurement of reporting time, based on 12 read results of abdomen-pelvis CT scans at normal reporting speed. These reads were conducted during the course of regular working days, on studies that were not part of the sample set.

The study was performed in 2 stages, after the baseline reading speeds were established. In week 1, two radiologists were randomly assigned to read a set of 12 studies at "fast speed" (twice as fast as their baseline reading speed, or in one half their normal reporting time); the other 3 radiologists were instructed to report at their normal reading speed. The set of 12 studies randomly included studies of variable complexity, with 3 classified into each of the 4 levels.

In week 3, the radiologists were assigned a different set of 12 studies, with a similar mix of level-1, level-2, level-3, and level-4 studies, but they switched their reading speed (eg, the radiologists who read fast the first week, read at their normal speed in week 3, and vice versa). The set of 12 studies was different from that in week 1, to exclude recall bias. A stopwatch was used to keep track of the reporting time. Per our study design, if any interruptions occurred, the stopwatch was paused; however, most reports were not interrupted.

The radiologists reported in the same environment as in everyday practice, under identical viewing conditions. The CT scans were reviewed using a McKesson version of a PACS. The readings were reported via the same dictation software normally used by this radiology practice on a daily basis (Nuance Powerscribe 360, Burlington, Massachusetts). Most studies were reported after normal work hours, with a minority reported during the normal workday. All studies and reports were reviewed by a separate board-certified radiologist with 10 years of work experience, who had fellowship training in MRI, to establish the major and minor misses. Additionally, patient outcome (eg, discharge, hospital admission, or surgery and pathology reports) was confirmed with electronic medical records to support the category of the major or minor miss findings. Finally, the reports were analyzed, and the misses and interpretation errors were recorded.

We categorized misses and interpretation errors into major and minor misses. The major miss category included findings with the potential to have a clinically