Does the Inclusion of Patient Photos in Image Review Impact Viewing Time and Search Strategies?

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Hypothesis

A previous study demonstrated that it might be useful to include photographs of patients during the interpretation process in order to increase detection of mislabeled medical imaging studies. The hypotheses in the present study were that the inclusion of the photograph during interpretation would alter the visual search patterns of radiologists and that some radiologists would prefer to have photos present while others would not.

Introduction

Tridandapani et al. recently conducted an observer study using facial photographs obtained simultaneously with portable chest radiographs and demonstrated that the presence of the photos increased the identification of wrong-patient errors without substantial increase in interpretation time. They concluded that inclusion of photographs could have a substantial impact on patient care and safety in medical imaging, but more study is warranted.

The question that arose from this study is how were the photos integrated into the visual search patterns of the radiologists and what exactly would account for the fact that despite having more information and an additional image, why didn't viewing time increase substantially? The goal of the present study was to investigate this question.

Methods

There were ten subjects in the study, 6 males and 4 females. The average age was 43.00 years (sd = 12.45, range 33-76) and the average years Board-certified was 9.70 (sd = 12.12, range = 0-41) with 2 in-training (residents), 1 general, 2 body, 4 cardiothoracic and 1 pediatric radiologist. The radiologists viewed 21 chest images with and without a photo of the patient while search was recorded. Their task was to note tube/line placement. Prior to and after the study the subjects filled out a survey regarding under what circumstances they call referring physicians with questions and/or findings; and after the study they also answered questions regarding the photographs.

Results

The eye-tracking data were analyzed with repeated measures Analyses of Variance (ANOVA) with the eye-tracking parameters as the dependent variables and image (chest image alone, chest image with photo present, photo) as the independent variable. The Protected Least Squares Difference (PLSD) post hoc test was used to test for significant differences between the three types of images. The number of fixations generated was significantly higher (p < 0.0001) when there was only the radiograph present (98.68 fixations on average) than on the radiograph when the photo was present (mean = 80.81) or on the photo (mean = 10.59). Mean fixation duration was significantly (p < 0.0001) on the photo (0.37 sec) than on the radiograph (mean without photo = 0.31, with = 0.30). Total mean dwell (p < 0.0001) averaged 30.84 sec when only the
A radiograph was present and dwell on the radiograph dropped to 25.68 sec on average with the photo and dwell on the photo was 3.93 sec on average. First fixation dwell was highest ($p < 0.0001$) on the photo compared to the radiograph (0.23 without and 0.22 with photo). The number of times the subjects looked off an image then returned was highest ($p < 0.0001$) on the radiograph when the photo was present (mean = 4.70 times) followed by the photo (mean = 3.15) and radiograph alone (mean = 1.77).

The eye tracking data were also analyzed using gender and specialty (cardiothoracic vs not cardiothoracic) as independent variables. Only number of visits to an image revealed significant differences. For gender ($F = 6.73, p = 0.0104$), males had significantly more visits to all images than females (Figure 2). For specialty ($F = 13.13, p = 0.0004$), the cardiothoracic radiologists had significantly fewer visits to all images compared to non-cardiothoracic radiologists.

With respect to the question “On a scale of 0-10 how much would you prefer to have a patient’s photograph available at the time of interpretation?”, the mean response was 6.10 (sd = 2.77, median = 6.00, IQR = 4.00, range = 2-10). There was no significant correlation between preference rating and age ($r = -0.316, z = -0.866$) or years Board-certification ($r = -0.274, z = -0.744$). There was no significant difference as a function of gender ($t = 1.623, p = 0.1432$) or as a function of being a cardiothoracic radiologist vs non-cardiothoracic ($t = 0.355, p = 0.7320$).

**Figure 1**
Discussion

Time viewing the cases did not differ as was observed in the Tridandapani et al. study. It appears that this is due to the fact that when the photo was present the radiologists decreased their time scanning the radiograph and spent that time on the photo. On average readers scanned to the photos about 4 times during search. Men and non-cardiothoracic radiologists spent significantly more time looking at all the images including the photos. Average preference for having photos was 6.10 on 0-10 scale and neck and chest were preferred as areas to include. Photos may help with certain image interpretation tasks and may help personalize the reading experience for radiologists.

Further investigation is required as this study only used one type of image and one type of task. Whether photos impact search with other images and tasks is not known, whether the effect would occur in the clinic is not known, and whether the radiologists would continue to look at the photos in the long term is not known. There may be a novelty effect that may wear off over time, although as a number of the radiologists noted that they would like the photos present clinically some may continue to scan them in the long term.

Conclusion

Visual search is impacted when a photograph of a patient is included during the interpretation process. Total viewing time does not change but rather radiologists divide their time differently when the photo is present, spending slightly less time on the radiograph than when no photo is present. The Tridandapani et al. study showed that the photo may positively impact the interpretation process by reducing errors due to
mislabeling, thus the alteration in viewing patterns may not be a negative factor in interpretation. Radiologists seem to take the same amount of time to accomplish the task at hand by compensating for the added visual information in their search strategies.

References


Keywords

Visual Search, Patient Photograph, Workflow, Viewing Time