

Nursing Informatics

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[AP1-E2-2-03] Nurses' Search of Patients' Electronic Medical Records and Their Understanding of Patient: A Study Using Eye Tracking and Follow-up Interviews

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Keywords: Information-seeking Behavior, Electronic Medical Records, Nursing Informatics, Eye-tracking

Japanese nurses spend a lot of time collecting information from EMRs. The present study aimed to determine the kinds of information in a patient's EMR that nurses search for before their shift, the amount of time needed to find such information and, ultimately, the kinds of information nurses are learning and retaining related to a patient's care. Using a hospital's EMR system development environment, we created medical records according to hospital rules for three hypothetical patients being treated for pneumonia. The Tobii AB Eye Tracker 4C was used to track the eye. The point of gaze and the movement of the line of sight was displayed on the screen. Each participant's line of sight was recorded while they routinely searched for information through the EMRs. Every second of the moving image data was analyzed. After completing their searches, participants were interviewed for 30 minutes to confirm what information they were able to collect and the accuracy of the tracking. A total of five nurses participated in the study. The nurses in this study ultimately found the information they needed from three hypothetical patient EMRs to perform their jobs by viewing 89 screens in around 15 minutes. Most nurses could understand (1) activities of daily living performance of patients, (2) daily care tasks. However, they had difficulty remembering (3) symptoms, care-related points to monitor carefully, (4) clinical predictions. The results suggested that EMRs tended to impede an integrated consideration of a patient's care that included factors such as clinical predictions.

Nurses' Search of Patients' Electronic Medical Records and Their Understanding of Patient: A Study Using Eye Tracking and Follow-up Interviews

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Abstract

Japanese nurses spend a lot of time collecting information from EMRs. The present study aimed to determine the kinds of information in a patient's EMR that nurses search for before their shift, the amount of time needed to find such information and, ultimately, the kinds of information nurses are learning and retaining related to a patient's care. Using a hospital's EMR system development environment, we created medical records according to hospital rules for three hypothetical patients being treated for pneumonia. The Tobii AB Eye Tracker 4C was used to track the eye. The point of gaze and the movement of the line of sight was displayed on the screen. Each participant's line of sight was recorded while they routinely searched for information through the EMRs. Every second of the moving image data was analyzed. After completing their searches, participants were interviewed for 30 minutes to confirm what information they were able to collect and the accuracy of the tracking. A total of five nurses participated in the study. The nurses in this study ultimately found the information they needed from three hypothetical patient EMRs to perform their jobs by viewing 89 screens in around 15 minutes. Most nurses could understand (1) activities of daily living performance of patients, (2) daily care tasks. However, they had difficulty remembering (3) symptoms, care-related points to monitor carefully, (4) clinical predictions. The results suggested that EMRs tended to impede an integrated consideration of a patient's care that included factors such as clinical predictions.

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Introduction

Electronic medical records (EMRs) are now widely used in Japan, 78.1% in hospitals with more than 400 beds [1]. However, reports have indicated that more than 450 types of screens exist in these systems [2] and that, on average, nurses view 48.6 screens before the beginning of their shifts [3]. As a result, pre-shift searches for information have become the principal cause for overtime [4]. Research on nurses seeking information has thus far been conducted using access logs [2]. While access log studies can clarify EMR screen transitions, they cannot clarify onscreen content. Thus, research has yet to reveal what information nurses are collecting over what periods of time. This study is the first to attempt using the Tobii AB Eye Tracker 4C, an inexpensive device commercially sold for use with video games. This pilot study aimed to determine the kinds of information in a patient's EMR that nurses search for before their shift, the amount of time needed to find such information and,

ultimately, the kinds of information nurses are learning and retaining related to a patient's care.

Methods

Using a hospital's EMR system development environment, we created medical records according to hospital rules for three hypothetical patients being treated for pneumonia, one of the hospital's more prevalent patient conditions. The research participants consisted of nurses with at least 10 years' experience, recommended by their supervisors as "conducting excellent nursing practice." To track their EMR search behavior, we used the Tobii Technology Eye Tracker 4C, which uses a technique called pupil center corneal reflection and does not come into direct contact with the eye. This device tracks the viewer's point of gaze, showing where it stops and moves on the screen. Participants looked for information as they always do in a patient's EMR, and the device drew and recorded where their point of gaze fell on the display screen. After completing their searches, participants were interviewed for 30 minutes to confirm what information they were able to collect and the accuracy of the tracking. The informational items we evaluated were as follows: (1) activities of daily living performance of patients, (2) daily care tasks, (3) symptoms, care-related points to monitor carefully, and (4) clinical predictions. We analyzed the eye tracking data from the videos of the nurses searching for information by one-second intervals.

Compliance with Ethical Standards

The study was conducted with the approval of the Ethical Review Board at University of Hyogo. The eye tracking experiment and interviews were performed in an office where privacy could be maintained, after each participant had provided informed consent.

Results

Five nurses (Ns 01–05) performed their usual data searches on the EMRs of all three hypothetical patients (Pt 01–03) for a total of 15 cases. The median time spent looking for information on the three patients was 15 minutes and 13 seconds, during which the nurses viewed 89 screens. The eye-tracking analysis showed that 50% of the recorded search time was not spent on meaningful collection of information but was used for operational functions. The nurses spent this "operational time" looking for the correct screen, waiting for screens to load, operating the console, and taking notes. As to the rest of the time, in descending order, reading nursing records accounted for 13.6%, going through checklists (e.g., prescription management and care schedules) accounted for 12.6%, reading the physician's records accounted for 6.6%, checking for physician instructions

accounted for 5.7%, and looking at observational assessments accounted for 5.0%.

The follow-up interview results are shown in Table 1. Follow-up interviews regarding Pt02 were conducted and analyzed for all five nurses (Ns01-05). Analysis of (1) patients' activities of daily living performance which considered whether "the condition requires constant supervision" was included. The results confirmed that all the nurses had understood this. Analysis of (2) daily care tasks considered whether "antibiotic IV," "blood sugar testing," "assistance with medication before or after meals," and "bed bathing" were included. The results confirmed all nurses had understood these. Analysis of (3) symptoms and care-related points to be carefully monitored considered whether the four items "fever," "drop in blood pressure," "disorientation," and "diarrhea" were included. The results confirmed that Ns02 and Ns04 recalled three items, Ns01 and Ns03 recalled two items, and Ns05 recalled one item. Concerning (4) clinical predictions, the participants were divided into those that responded and those that did not. Ns01, Ns02, and Ns04 gave a response, while Ns03 and Ns05 answered with "I don't know."

Table 1 - Interview results(pt02)

	Ns01	Ns02	Ns03	Ns04	Ns05
(1) ADL	○	○	○	○	○
(2) daily care tasks	○	○	○	○	○
(3) fever	○	○	○	○	×
(3) drop in blood pressure	×	×	×	×	×
(3) disorientation	×	○	×	○	×
(3) diarrhea	○	○	○	○	○
(4) clinical predictions	○	○	×	○	×

Discussion

The EMRs currently used by nurses to perform their jobs are designed to prioritize treatment. The types of documentation the system is required to produce related to the national health insurance system and to aid cross-disciplinary collaboration continue to increase every year. As such, EMRs are designed to perform many different functions. Nurses face difficulty in identifying the screen on which the information they need is located; 58.8% of nurses reportedly think finding the relevant information takes too long [5]. The fact that the system hinders effective searching was demonstrated by the amount of time nurses spent operating the system and the number of screens they viewed. Good nursing practice is expected to be a result of the integration of diagnostic, therapeutic, and ethical judgments based on available information [6]. However, our results suggested that, although the nurses' searches of the patients' EMRs enabled them to understand what their duties for the day were, they had difficulty remembering the symptoms and care-related points that needed to be carefully monitored, as well as identifying clinical predictions for the patient. This finding suggests that the EMRs may be preventing the nurses from taking a more integrated approach to patient care. Future studies will need to focus on how to better organize nursing information in EMRs and to propose more effective approaches.

Conclusion

The nurses in this study ultimately found the information they needed from three hypothetical patient EMRs to perform their jobs by viewing 89 screens in around 15 minutes. Most nurses could understand (1) activities of daily living performance of patients, (2) daily care tasks. However, they had difficulty remembering (3) symptoms, care-related points to monitor carefully, (4) clinical predictions. The results suggested that the system tended to impede an integrated consideration of a patient's care that included factors such as clinical predictions.

Study Limitations

This was a pilot study of nurses with at least 10 years' experience recommended by their supervisors as "conducting excellent nursing practice." Based on the present results, we plan to carry out a comparative study with an increased sample size of novice and veteran nurses. Our ultimate goal is to determine "what information is deemed to be crucial for excellent nursing practice."

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