Exploring Residents’ Interactions With Electronic Health Records in Primary Care Encounters

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OBJECTIVES: Our objective was to explore and compare residents’ interactions with electronic health records during primary care encounters and whether those behaviors differ by residency year level.

METHODS: A field study was conducted in which 38 patient visits with 12 family medicine resident physicians were observed and video recorded in two primary care clinics under the umbrella of a university-based department of family medicine. Videos were then coded for gaze behaviors in which patients’ and physicians’ gazes at electronic health records and at each other were coded using a pre-established objective coding scheme.

RESULTS: Third-year residents spent the greatest percentage of visit time looking at EHR screens when compared to first- and second-year residents. Third-year residents also spent significantly more time typing or inputting information into the records during the clinical visit when compared to first- and second-year residents.

CONCLUSIONS: This study illustrated that patterns for using the EHR and interacting with patients may change over time for residents. These changes may be due to increased EHR proficiency or increased workload that incentivizes using the EHR to retrieve information and to complete charting in front of the patient.

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The US health care system is undergoing a major transition from paper-based to electronic health records (EHR). The EHR adoption rate was estimated to be 68% in 2011 among family physicians.1 Government funding and incentives have fostered this growth. Studies have reported the potential benefits of EHRs, including cost savings, efficiency, and safety2-4 and enriched patient data.5 However, concerns have also been raised about potential negative impact on the physician-patient relationship and communication.6-8

There is a small but growing literature on teaching of EHR skills to medical students and residents.9-14 However, no study to date has objectively examined differences between residents at different levels of training in regards to how they interact with the EHR and patients. Rouf et al15 found that patients of internal medicine residents, compared to those of faculty physicians, were more likely to feel that the computer adversely affected the amount of time physicians spent talking, looking at, and examining them. This suggests that with experience—either clinical or specifically with the use of the EHR—physicians become more skillful in incorporating the EHR into patient encounter. However, Rouf et al did not use objective measures of physician behavior nor did they examine differences in residents of different year levels. To address this gap, we undertook the present exploratory, cross-sectional study in which we compared first-, second-, and third-year family medicine residents in the exam room. In so doing, we used technology and methods our group has used in previous studies.16,17

Methods

Study Setting and Participants

This study was performed during a 4-month period from February to May 2012 at two primary care clinics under the umbrella of the University of Wisconsin-Madison. At each site, physicians used the same EHR system, physical space, and clinical support system. The physical setup of the exam rooms was as follows: The physician sat centered at a small desk while the patient sat

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at one end of the desk, facing forward. All EHRs’ screens are located on the wall between the patient and the physician and facing toward them. All the screens also have the ability to be moved around by the physicians.

A convenience sampling strategy was used to recruit physicians and patients. An instruction form was sent to all residents via email (36) explaining the study, and follow-up reminders were also sent. Those who agreed to participate signed an informed consent form allowing the researchers to video record their patient visits. For patient recruitment, we focused on established, adult patients of residents who agreed to participate in the study. Eligibility requirements for the patients were (1) being between 18–65 years old, (2) having had at least one previous visit with the respective participating resident, (3) being scheduled for a 30-minute for PGY-2 and PGY-3 and 45 minute for PGY-1 follow-up visit for the current appointment. In addition, per IRB requests, patients who discussed or planned to discuss socially stigmatizing conditions such as substance abuse, illegal activity, abortion, or mental illness were also excluded from participating in the study and were not recorded. Study procedures and activities were approved and monitored by university and clinic Institutional Review Boards (IRBs). We used three high-resolution video cameras, each placed at a different angle to record the visits, and created one single multichannel video for analysis. In addition, we had a short open-ended survey with residents involving questions regarding their demographics, training about EHR use, and how they develop their EHR use style.

Data Analysis
A systematic coding methodology was used to quantify human-human and human-technology interactive behaviors in the visit. In this study, a coding scheme was adapted from a previous study. All coders were trained well, and their coded videos were checked constantly to maintain at least 0.60 kappa reliability score. Each video was coded temporally for the entire visit length using multichannel stream with a half speed (1/2 sc) in order to allow the coders to capture and quantify all behaviors accurately. The two variables we used for analysis were eye gaze and typing. For quantified video data, the average percentage rates for each behavior were reported. In addition, we used Welch’s $t$ test to estimate significant differences across the resident groups. Significant values were reported using a $P$ value of at least .05.

Results
Twelve residents (four residents from each year) agreed to participate out of 36 residents in total (participation rate: 33%). The age range of the participating residents was 28–31 years old (mean=29.5). Five of the residents were male. Thirty-eight out of 90 approached patients (43%) agreed to participate (nine patients by PGY-1, 15 patients by PGY-2, 14 patients by PGY-3). The age range of the patients was 20–61 years old (mean= 39) (Table 1).

![Table 1: Patient Demographics](https://example.com/table1.png)

We used the terminology “adjusted visit length,” which was defined as the length of time the physician spent in the exam room with the patient excluding physical exam period and the time when the physician was out of the room. The average adjusted visit length for all visits was 1,286 seconds (21 minutes). The average adjusted visit length for each resident group were as follows: 1,737 seconds (PGY-1), 1,352 seconds (PGY-2), and 977 seconds (PGY-3). Significant differences were found in adjusted visit length between PGY-1–PGY-2 ($P=.003$), PGY-1–PGY-3 ($P=.003$), and PGY-2–PGY-3 ($P=.009$).

Residents’ Interaction With EHR
Residents reported that they each developed their own EHR use style due to lack of formal training on how to interact with the EHRs and patients. The values were calculated as percentages of adjusted visit length rather than duration in order to obtain a more accurate estimate of the amount of time physicians interacted with patients. Figure 1 illustrates all percentage values for interaction with EHRs for each resident group as a ratio to adjusted visit length. “Overall” indicates the mean across...
the all visits (38 visits) in the study collapsed across resident group.

Across resident groups, PGY-3s gazed at the EHR significantly longer than PGY-1s (\(P=.003\)) and PGY-2s (\(P=.002\)). PGY-3s also typed significantly more during the visit than PGY-1s (\(P=.001\)). There were no significant differences between groups for “patient gaze at EHR” (PGE) and “shared gaze at EHR” (SE).

Residents’ Interaction With Patients

Figure 2 illustrates all values regarding interpersonal communication for overall sample and each resident group.

Although there were remarkable percentage differences across some groups, we did not observe any significant differences presumably because of the small sample size.

Patients’ Survey Result

Table 2 depicts results of several items from the questionnaires. Further, statistical analysis yielded several significant differences between items: “I felt frustrated when the doctor used the computer” PGY-2 and PGY-3 (\(P=.036\)), “computer use made visit less personal” PGY-2 and PGY-3 (\(P=.023\)), “the doctor’s computer use was distracting” PGY-2 and PGY-3 (\(P=.044\)).

Discussion

The present study found that more senior family medicine residents spent more time gazing at the computer screen and more time typing than more junior residents, which might suggest that there may be a linear progression of these behaviors across the 3 years of the residency. While the patient survey data yielded largely nonsignificant results, the patients of the most senior (PGY-3) residents felt their physicians’ computer use was distracting, were the most frustrated.
with their physicians’ computer use, and felt their visits were the least personal. Quantified video data also showed that PGY-3 residents has highest amount of interaction with EHR (which was significant) and lowest percentage of gazing at patient (this was not statistically significant) compared to other PGY groups. It may be that the increase in use of the computer by the third-year residents reflected increased knowledge of and, perhaps, comfort with their patients, compared to the more junior residents. However, it would appear from the results that this may not be appreciated by the most senior residents’ patients. In addition, the patient survey results suggest that patients of senior residents felt frustrated by the use of the computer and felt the visits were less personal, which might influence caring relationship and some of the patient outcomes negatively. Finally, we should also note that we only examined nonverbal aspect of the visit; we did not explore verbal communication.

There might be two potential explanations of the findings regarding the differences in the residents across year levels. First, first-year residents spend less time looking at the computer screen and typing because of their lack of confidence in and lack of facility with the EHR. This is also suggested by the patient perceptions (patient survey) that residents’ success in using the EHR increased with year level. As a result, less experienced residents may avoid using the EHR (including writing their notes) while they are in the exam room. As they become more skillful and confident over time in the use of the EHR, they might feel more comfortable utilizing the EHR and entering data in the presence of patients.

The second explanation of the results relates to the scheduling templates for the different year levels of the residents. Residents are required to see more patients per session as they progress through the years. As a result, they are expected to spend progressively less time per patient as they advance through the program. These differential expectations are reflected in the lengths of the visits we found for the residents of various year levels. It is also plausible that the differences between less and more advanced residents reflected greater time pressure

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<thead>
<tr>
<th>Table 2: Descriptive Results of Several Survey Questions</th>
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<td>How satisfied were you with overall visit?</td>
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<tr>
<td>How would you rate the doctor’s manners during the visit?</td>
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<tr>
<td>How satisfied were you with the doctor?</td>
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<tr>
<td>The doctor pretends to know things when he/she is really not sure.</td>
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<tr>
<td>The doctor does not always give me a chance to say everything I think he/she needs to know.</td>
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<tr>
<td>I am satisfied with how the doctor and I communicated.</td>
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<tr>
<td>I want to know what the doctor is typing into the computer.</td>
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<tr>
<td>I felt frustrated when the doctor used the computer.</td>
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<tr>
<td>The doctor’s computer use was distracting.</td>
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<td>I felt comfortable speaking to the doctor while he/she was typing.</td>
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<td>The doctor was knowledgeable about the computer.</td>
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<td>The doctor was successful in their use of the computer.</td>
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<td>The doctor was confident using the computer.</td>
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<td>The doctor relied heavily on the computer.</td>
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<tr>
<td>Because of the computer, the doctor spent less time looking at me than I liked.</td>
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<tr>
<td>Because of the computer, the doctor spent less time talking with me than I liked.</td>
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<tr>
<td>Computer use made the visit feel less personal.</td>
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**Note:** Likert scales, with 1 being “strongly disagree” and 5 being “strongly agree.”
experienced by the latter. For example, a third-year resident would have less time to review a patient’s chart before the visit and less time to write a note afterwards than a first-year resident. Thus, the more experienced residents would have greater incentives to utilize EHR information and do their charting in front of the patient. The alternative may be doing their charting after hours.

There are several limitations to this study. First, this was a cross-sectional study in that we did not follow the residents as they progressed through the program. Second, the sample size is small, which resulted in lower statistical power. Third, the low participation rate of residents might call to question the attitudes and skills of residents who did not participate in the study. The low participation rate could be due to their busy schedules and/or no precedent for their being taped in a research project. Thus, it may not have been a representative sample. Fourth, the fact that one ergonomic setup was used in all of the exam rooms makes generalization uncertain to other arrangements, especially those that are more conducive to direct physician-patient gaze. Finally, we acknowledge that the behaviors we examined—as important as they may be—do not constitute the totality of the clinical encounter. As Zoppi and Epstein asserted, there are other “intangible” elements of the physician “way[s] of being” that impact patients’ perceptions that cannot be objectively observed.21 Further, we did not evaluate such important elements as clinical judgment or the thoroughness of physical examinations.

With these limitations in mind, to our knowledge, this is the first study that compared EHR behavior of residents of various levels of experience. The fact that none of the 12 participating residents had any formal instruction on how to incorporate the EHR into their communications with patients is, in itself, revealing and, we believe, may indicate a larger neglect of this topic.9,13 In spite of the growth of the use of EHRs, our review of the literature revealed an absence of studies on how to best teach residents use of the EHR in their interactions with patients, let alone on the outcome teaching programs in this area. The present study might stimulate future research in this area.

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References

6. Als AB. The desk-top computer as a magic box: patterns of behaviour connected with the desk-top computer; GP’s and patients’ perceptions. Fam Pract 1997;14(1):17.