

**ORIGINAL RESEARCH**

# EHR use and patient satisfaction: What we learned

In this study, how much time a physician spent looking at the patient predicted greater patient satisfaction. Overall, however, patients were highly satisfied with their physicians despite high EHR usage.

**ABSTRACT**

**Purpose** ▶ Few studies have quantitatively examined the degree to which the use of the computer affects patients' satisfaction with the clinician and the quality of the visit. We conducted a study to examine this association.

**Methods** ▶ Twenty-three clinicians (21 internal medicine physicians, 2 nurse practitioners) were recruited from 4 Veteran Affairs Medical Center (VAMC) clinics located in San Diego, Calif. Five to 6 patients for most clinicians (one patient each for 2 of the clinicians) were recruited to participate in a study of patient-physician communication. The clinicians' computer use and the patient-clinician interactions in the exam room were captured in real time via video recordings of the interactions and the computer screen, and through the use of the Morae usability testing software system, which recorded clinician clicks and scrolls on the computer. After the visit, patients were asked to complete a satisfaction survey.

**Results** ▶ The final sample consisted of 126 consultations. Total patient satisfaction ( $\beta=0.014$ ;  $P=.027$ ) and patient satisfaction with patient-centered communication ( $\beta=0.02$ ;  $P=.02$ ) were significantly associated with higher clinician "gaze time" at the patient. A higher percentage of gaze time during a visit (controlling for the length of the visit) was significantly associated with greater

satisfaction with patient-centered communication ( $\beta=0.628$ ;  $P=.033$ ).

**Conclusions** ▶ Higher clinician gaze time at the patient predicted greater patient satisfaction. This suggests that clinicians would be well served to refine their multitasking skills so that they communicate in a patient-centered manner while performing necessary computer-related tasks. These findings also have important implications for clinical training with respect to using an electronic health record (EHR) system in ways that do not impede the one-on-one conversation between clinician and patient.

Primary care physicians' use of electronic health record (EHR) systems has markedly increased in recent years. For example, a 2008 study of more than 1000 randomly selected practicing physicians in Massachusetts found that 33% utilized an EHR.<sup>1</sup> Many physicians believe that EHR systems are beneficial to patient care,<sup>2</sup> and several studies have supported this perception, showing clear benefits of EHR use. A study of one component of EHR systems—computerized physician order entry (CPOE)—found that CPOEs resulted in a >50% decrease in serious medication errors.<sup>3</sup> Other errors have declined with the use of EHR systems, as well; Virapongse et al<sup>1</sup> found a trend towards fewer

Neil J. Farber, MD; Lin Liu, PhD; Yunan Chen, PhD; Alan Calvitti, PhD; Richard L. Street, Jr., PhD; Danielle Zuest, MA; Kristin Bell, MD; Mark Gabuzda, MD; Barbara Gray, MA; Shazia Ashfaq, MD, MBA; Zia Agha, MD, MS  
University of California, San Diego (Drs. Farber, Liu, Calvitti, and Agha); University of California, Irvine (Dr. Chen); Texas A&M University, Dallas (Dr. Street); Veterans Medical Research Foundation, La Jolla, Calif (Mss. Zuest and Gray); VA San Diego Healthcare System (Drs. Bell, Gabuzda, and Ashfaq)

[nfarber@ucsd.edu](mailto:nfarber@ucsd.edu)

The authors reported no potential conflicts of interest relevant to this article.

This research was supported by VA HSRD/IR 07196 (Agha, PI), Department of Veterans Affairs. Dr. Street's support was provided by the Houston VA Health Services Research & Development Center of Excellence (HFP90-020), now called the Houston VA Center for Innovations in Quality, Effectiveness and Safety (CIN 13-413).

**Higher clinician gaze time at the patient predicted greater patient satisfaction.**

paid malpractice claims against physicians who used an EHR compared to those physicians using paper charting.

EHR systems may also improve efficiency. In a study of a health maintenance organization (HMO) model, initiating an EHR system improved efficiency by decreasing office visits.<sup>4</sup> Widespread adoption of EHR systems could save an estimated \$81 billion annually through reductions in errors and adverse events, and improved preventive care and chronic disease management.<sup>5</sup> In a survey of approximately 300 patients who had been evaluated at a family medicine clinic for hypertension, high blood pressure without hypertension, or hyperlipidemia, 75% indicated that they felt EHRs had a positive impact on their care.<sup>6</sup>

However, some clinicians are concerned about the possible negative impact of EHR systems on health care. One major concern is that EHR systems might increase physician workload<sup>7</sup> and the amount of time spent using a computer during patient visits. A study that examined physician EHR use found that while time spent on certain tasks, such as prescription writing and lab ordering, was reduced, there was an overall increase in time spent on computer tasks related to charting, preventive care, and chronic disease management.<sup>8</sup> Baron et al<sup>9</sup> also found an increase in time spent using the EHR during each clinic session in one private practice setting.

Physicians are also concerned that EHR systems might interfere with the patient-physician interaction (eg, maintaining eye contact, paying attention to patients' concerns) by directing the physician's attention away from the patient and toward the computer.<sup>10</sup> In one study, this concern increased after physicians started utilizing a new EHR system.<sup>11</sup> Although a survey of inpatients indicated that residents engaged in greater patient-physician communication after an EHR was implemented,<sup>12</sup> a separate study conducted in an outpatient setting found physicians spent less time looking at patients after converting from a paper-based system to an EHR system.<sup>13</sup>

Very few studies have quantitatively examined the association of patient satisfaction with clinician EHR usage. The goal of

this study was to examine the correlation of patient satisfaction with actual EHR usage in an ambulatory setting. The data reported in this paper are part of a larger study aimed at understanding EHR use in a VAMC.

## **METHODS**

### **Study design and sample**

The study participants were clinicians in 4 VAMC community clinics located in San Diego, Calif. Twenty-three clinicians (21 general internal medicine physicians and 2 nurse practitioners) were enrolled in the study. Most clinicians identified 5 to 6 patients from their practices to participate in the study (2 participants identified only one patient each). All patients were visiting their clinician for either an acute visit or a follow-up visit.

Although there were slight variations in clinic room size and shape, all rooms were equipped with a compact desk against a wall, a rolling desk chair, a desktop computer with keyboard and mouse, and a second, fixed chair placed diagonal to the physician's chair. Two rooms had dual monitors. There was a standard examination table in all examination rooms.

The clinicians' computer use and the patient-clinician interactions in the exam room were captured in real time via video recordings of the interactions and the computer screen. A usability testing software system (Morae) was used to record clinicians' computer activities, including mouse clicks and scrolls on the computer. The Computerized Patient Records System (CPRS) was the EHR used by all clinicians in this study.

At the end of the visit, patients were asked to complete a satisfaction survey with questions in 3 domains: the physician's engagement in patient-centered communication, the physician's clinical skills, and the physician's interpersonal skills.

### **Data analysis**

Descriptive statistics were used to document patient characteristics, the clinicians' EHR usage (total number of mouse clicks and scrolls during the visit) and interaction with the patient (gaze time at EHR vs at patient

**TABLE 1**  
**Patient characteristics**

Characteristic	N (%)
Age (years):	—
Mean (SD): 60.5 (13.4)	
Median (range): 62 (25-88)	
<b>Gender</b>	
Male	122 (96.8)
Female	4 (3.2)
<b>Race and ethnicity</b>	
Caucasian	82 (65.1)
African American	19 (15.1)
Asian	10 (7.9)
Other	15 (11.9)
<b>Education</b>	
High school or lower	23 (18.3)
Some college	48 (38.1)
College graduate	27 (21.4)
More than college	28 (22.2)
<b>Annual income*</b>	
<\$20,000	31 (25.4)
\$20,000-40,000	41 (33.6)
\$40,000-60,000	21 (17.2)
>\$60,000	29 (23.8)
<b>Marital status</b>	
Married	75 (59.5)
Other	51 (40.5)

SD, standard deviation.

\* Four patients did not provide this information.

and companion), and to summarize patient satisfaction with the visit. To account for clinician cluster effect, a linear mixed effects model was used to assess the associations between patient satisfaction with the clinician and 2 variables: the amount of clinician time spent viewing or using the computer and the clinician time spent interacting with the patient.

We also assessed the above associations by controlling for visit length. Visit lengths not significant at  $P < .10$  were reported as unadjusted analyses.

All analyses were performed using

R statistical software, with a  $P$  value of  $< .05$  interpreted as statistically significant.

## RESULTS

Satisfaction surveys and video and Morae data were collected for 126 individual patient office visits to the 23 participating physicians and nurses. A majority of the patients who participated in the study were older (mean: 60.5 years; standard deviation [SD]=13.4 years), male as expected in a VA setting (96.8%), Caucasian (65.1%), and had at least some college education (81.7%, TABLE 1).

Patients rated their satisfaction in 3 domains—patient-centered communication, physician clinical skills, and physician interpersonal skills—using a 1 to 5 scale (1=least satisfied, 5=most satisfied). Patients in this study were highly satisfied with their physician or nurse in all 3 domains and overall (TABLE 2), with an average satisfaction score of  $4.52 \pm 0.51$  for patient-centered communication,  $4.71 \pm 0.56$  for physician clinical skills,  $4.86 \pm 0.32$  for physician interpersonal skills, and  $4.64 \pm 0.38$  for total satisfaction.

The physicians and nurses used their EHR system extensively during the visits as delineated by the number of clicks and scrolls on the computer. The average number of clicks and scrolls was 192, with a maximum of 685 clicks and scrolls during one visit. The average visit lasted 30.7 minutes, and on average the clinician spent 12.7 minutes (SD: 8.22 minutes), or an average of about 39.4% of total visit time, viewing or working on the EHR; an average of 10.8 minutes (SD: 5.63 minutes), or an average of about 36.3% of total visit time, was spent interacting with the patient (TABLE 3).

Without adjusting for visit length, patient satisfaction with the clinicians' patient-centered communication (beta=0.02;  $P=.02$ ) and total satisfaction (beta=0.014;  $P=.027$ ) were significantly associated with clinicians' gaze time at the patient; more clinician gaze time at the patient resulted in greater patient satisfaction (TABLE 4). Adding visit length to the above models had no significant effect ( $P > .10$ ); therefore, we did not include it in the models.



The average number of computer clicks and scrolls per visit was 192, with a maximum of 685 clicks and scrolls during one visit.

CONTINUED

TABLE 2

## Patient satisfaction scores\*

Domain	Mean (SD)	Median (range)
Patient-centered communication	4.52 (0.51)	4.69 (2.06-5)
Physician clinical skills	4.71 (0.56)	5 (1.67-5)
Physician interpersonal skills	4.86 (0.32)	5 (3-5)
Total	4.64 (0.38)	4.77 (2.74-5)

SD, standard deviation.

\* Scale of 1 to 5, with 1=least satisfied and 5=most satisfied.

TABLE 3

## Physician EHR usage and gaze time at EHR and patient per visit

	Mean (SD)	Median (range)
Visit length (min)	30.7 (11.5)	29.2 (8.68-68.2)
EHR mouse click/scroll count	192 (150)	156 (0-685)
<b>Gaze at EHR</b>		
Time (min)	12.7 (8.22)	10.1 (1.38-36.1)
Percentage of time over whole visit (%)	39.4 (16.9)	34.9 (6.8-81.3)
<b>Gaze at patient</b>		
Time (min)	10.8 (5.63)	10.5 (1.19-27.3)
% of time over whole visit	36.3 (16.5)	35 (5-76.1)

EHR, electronic health record; SD, standard deviation.

Patient satisfaction with clinicians' interpersonal skills was positively associated with gaze time at the patient ( $\beta=0.013$ ,  $P=.017$ ) without adjusting for visit length. Since the normal assumption of residuals was not plausible based on a normal probability plot, we also assessed the association by dichotomizing the score (5=very satisfied vs <5=not very satisfied) and this significance disappeared. This association was not significant while controlling for visit length.

The percentage of gaze time at the patient (the fraction of patient gaze time over the entire visit) was not significantly associated with patient-centered communication ( $\beta=0.483$ ,  $P=.12$ , TABLE 4) when not adjusted for visit length. After adjusting for visit length ( $P=.052$ ), the association became significant ( $\beta=0.628$ ,  $P=.033$ ); thus, the higher percentage of time the clinician spent interacting with the patient, the more satisfied the patient was.

## DISCUSSION

In this study, patients were highly satisfied with their clinicians despite often high usage of the EHR. Gadd and Penrod<sup>11</sup> reported that patients perceived no impact on communication or eye contact with the clinician despite the initiation of an EHR system in 6 large academic medical practices. Another study demonstrated no significant differences in patient satisfaction with their physicians when comparing patients whose physicians used a paper charting system with those who used an EHR system.<sup>14</sup>

The fact that patients demonstrated high levels of satisfaction with patient-clinician communication even for clinicians with high EHR usage is somewhat surprising. However, Hsu et al<sup>15</sup> found patients' satisfaction with their clinicians' communication about medical issues and familiarity with them increased 7 months after implementing an EHR system. In a different study that analyzed videotaped interactions between



In this study, patients were highly satisfied with their clinicians, despite often high usage of the EHR.

**TABLE 4**  
**Association between patient satisfaction**  
**and EHR use and gaze time**

	Coefficients (beta)	P value
<b>Patient-centered communication</b>		
EHR mouse click/scroll count	0.0004	.34
Gaze at EHR		
Time (min)	0.002	.80
Percentage of time over the visit	-0.364	.24
Gaze at patient		
Time (min)	0.02	.02
Percentage of time over the visit	0.483	.12
<b>Physician clinical skill*</b>		
EHR mouse click/scroll count	0.0001	.86
Gaze at EHR		
Time (min)	-0.0004	.95
Percentage of time over the visit	-0.239	.47
Gaze at patient		
Time (min)	0.008	.39
Percentage of time over the visit	0.251	.46
<b>Physician interpersonal skill*</b>		
EHR mouse click/scroll count	0.0002	.24
Gaze at EHR		
Time (min)	0.003	.42
Percentage of time over the visit	-0.085	.64
Gaze at patient		
Time (min)	0.013	.017 <sup>†</sup>
Percentage of time over the visit	0.225	.22
<b>Total satisfaction</b>		
EHR mouse click/scroll count	0.0003	.34
Gaze at EHR		
Time (min)	0.0024	.63
Percentage of time over the visit	-0.210	.37
Gaze at patient		
Time (min)	0.014	.027
Percentage of time over the visit	0.286	.23

EHR, electronic health record.

\* Sensitivity analysis has been done by dichotomizing the subscales (5 vs <5).

† P value changed from .017 to .12 while dichotomizing the subscale of physician interpersonal skill.

patients and 5 physicians, the patients found it disturbing not knowing what their doctor was doing when he or she worked on the

computer, and preferred being able to see the computer screen.<sup>16</sup> This study suggests that it's advisable for clinicians to describe

what they are doing when they use the computer, so that patients better understand how this time spent inputting data actually benefits them.

■ **EHRs can be time-consuming.** Physicians and nurses in our study interacted with the EHR a great deal during the office visit, as evidenced by the large average number of clicks and scrolls. This finding confirms clinicians' perceptions of the amount of work the EHR system requires. For example, in a semi-structured interview of physicians regarding their use of a VA EHR system,<sup>10</sup> one respondent noted that the reminders in the EHR required hundreds of clicks.

In our study, the average number of clicks and scrolls during the visit was 192, with some clinicians registering hundreds more. In fact, concerns about the time involved in the use of the EHR and about the adequacy of data collection may lead some clinicians who currently don't have an EHR system to be reluctant to integrate one into their practices.<sup>17</sup>

Makoul et al<sup>18</sup> found that compared with physicians who used a paper chart, physicians who used an EHR system were more active in clarifying information from the patient and encouraging patient questions during visits, although the study found a trend toward less active roles in more patient-centered communication when using an EHR system. This latter finding is similar to the concerns raised in our study.

■ **Clinical and communication skills are factors, too.** One study found that compared to patients who were cared for by more experienced physicians, patients seen by residents using EHRs were more likely to feel that the physician spent less time talking with them and examining them; they were also more likely to report that the visit felt less personal.<sup>19</sup> Another study found that clinicians with poor baseline communication skills had more difficulties interacting with patients when an EHR system was introduced than those who had better baseline communication skills.<sup>20</sup>

■ **Training needed to improve communication during EHR use.** Research has shown that when used properly and thoughtfully, EHR use can result in greater patient engagement.<sup>21</sup> But, as noted above, there are

challenges, suggesting a need for training clinicians to more successfully use an EHR system while simultaneously communicating with their patients.

■ **Study limitations.** This study was conducted at a single site, using a single EHR system deployed in the VA clinics. We cannot generalize our findings to other sites or types of clinic systems. Other EHR systems may have different functionalities, which may affect the time required to provide the same type of medical care.

In addition, the study involved only 23 physicians and nurses in a single health system. Other clinicians may have patterns different from those we studied, although a wide range of patterns was seen among the participants, as demonstrated by the large variation in the number of clicks and scrolls. Another limitation is that study patients were not randomly selected, but rather referred by the provider, and the visits were not blinded to either the provider or patient. This may cause some selection bias.

In this study of VA clinicians' EHR use, patients expressed satisfaction with the clinicians' clinical skills and patient-centered communication when the clinician spent more time and a greater percentage of the visit engaging the patient. EHR systems need to be designed in a clinician-friendly manner that allows for increased time during the interaction for face-to-face communication between the clinician and the patient, and to ease the workload of EHR documentation. In the meantime, clinicians should be trained in how to expedite their use of the EHR during the clinical visit as well as outside of the exam room in order to improve their patients' satisfaction. **JFP**

#### CORRESPONDENCE

Neil J. Farber, MD, University of California, San Diego, 8939 Villa La Jolla Drive, La Jolla, CA 92037; nfarber@ucsd.edu.

#### References

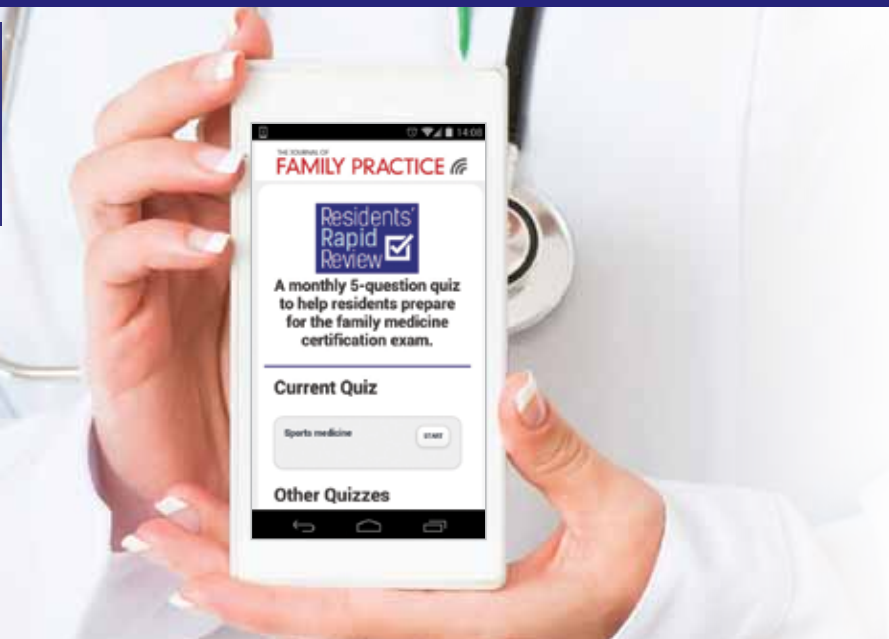
1. Virapongse A, Bates DW, Shi P, et al. Electronic health records and malpractice claims in office practice. *Arch Intern Med.* 2008;168:2362-2367.
2. DesRoches CM, Campbell EG, Rao SR, et al. Electronic health records in ambulatory care—a national survey of physicians. *N Engl J Med.* 2008;359:50-60.
3. Bates DW, Leape LL, Cullen DJ, et al. Effect of computerized physician order entry and a team intervention on prevention of seri-



**EHR systems need to be designed in a clinician-friendly manner that allows for increased time during the interaction for face-to-face communication.**



- ous medication errors. *JAMA*. 1998;280:1311-1316.
4. Chen C, Garrido T, Chock D, et al. The Kaiser Permanente Electronic Health Record: transforming and streamlining modalities of care. *Health Aff (Millwood)*. 2009;28:323-333.
  5. Hillestad R, Bigelow J, Bower A, et al. Can electronic medical record systems transform health care? Potential health benefits, savings, and costs. *Health Aff (Millwood)*. 2005;24:1103-1117.
  6. Garrison GM, Bernard ME, Rasmussen NH. 21st-century health care: the effect of computer use by physicians on patient satisfaction at a family medicine clinic. *Fam Med*. 2002;34:362-368.
  7. Likourezos A, Chalfin DB, Murphy DG, et al. Physician and nurse satisfaction with an Electronic Medical Record system. *J Emerg Med*. 2004;27:419-424.
  8. Howard J, Clark EC, Friedman A, et al. Electronic health record impact on work burden in small, unaffiliated, community-based primary care practices. *J Gen Intern Med*. 2013;28:107-113.
  9. Baron RJ. What's keeping us so busy in primary care? A snapshot from one practice. *N Engl J Med*. 2010;362:1632-1636.
  10. Bonner LM, Simons CE, Parker LE, et al. 'To take care of the patients': Qualitative analysis of Veterans Health Administration personnel experiences with a clinical informatics system. *Implementation Sci*. 2010;5:63.
  11. Gadd CS, Penrod LE. Dichotomy between physicians' and patients' attitudes regarding EMR use during outpatient encounters. *Proc AMIA Symp*. 2000;275-279.
  12. Migdal CW, Namavar AA, Mosley VN, et al. Impact of electronic health records on the patient experience in a hospital setting. *J Hosp Med*. 2014;9:627-633.
  13. Asan O, D Smith P, Montague E. More screen time, less face time - implications for EHR design. *J Eval Clin Pract*. 2014;20:896-901.
  14. Legler JD, Oates R. Patients' reactions to physician use of a computerized medical record system during clinical encounters. *J Fam Pract*. 1993;37:241-244.
  15. Hsu J, Huang J, Fung V, et al. Health information technology and physician-patient interactions: impact of computers on communication during outpatient primary care visits. *J Am Med Inform Assoc*. 2005;12:474-480.
  16. Als AB. The desk-top computer as a magic box: patterns of behaviour connected with the desk-top computer; GPs' and patients' perceptions. *Fam Pract*. 1997;14:17-23.
  17. Bates DW. Physicians and ambulatory electronic health records. *Health Aff (Millwood)*. 2005;24:1180-1189.
  18. Makoul G, Curry RH, Tang PC. The use of electronic medical records: communication patterns in outpatient encounters. *J Am Med Inform Assoc*. 2001;8:610-615.
  19. Rouf E, Whittle J, Lu N, et al. Computers in the exam room: differences in physician-patient interaction may be due to physician experience. *J Gen Intern Med*. 2007;22:43-48.
  20. Frankel R, Altschuler A, George S, et al. Effects of exam-room computing on clinician-patient communication: a longitudinal qualitative study. *J Gen Intern Med*. 2005;20:677-682.
  21. Asan O, Young HN, Chewing B, et al. How physician electronic health record screen sharing affects patient and doctor non-verbal communication in primary care. *Patient Educ Couns*. 2015;98:310-316.

## Residents' Rapid Review



# Residents: Are you getting ready for your family medicine certification exam?

Then check out our monthly Residents' Rapid Review quizzes, featuring prep questions written by the faculty of the National Family Medicine Board Review course.

-  This month's questions can be found at [www.jfponline.com](http://www.jfponline.com)
-  Registration is required. If you are not already registered, go to: [jfponline.com/residents\\_reg](http://jfponline.com/residents_reg)