Research article

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Electronic health record's effects on the outpatient office visit and clinical education

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ABSTRACT

Background   Providers have the important cognitive task of attending to the patient while using the electronic health record (EHR) during an office visit. Prior literature has demonstrated that the EHR has had various effects on the office visit. This study focused on providers who were medical and nurse practitioner student preceptors, to determine their perception of the EHR on multiple distinct aspects of the office visit and clinical education.

Methods   Utilizing survey research, provider's EHR utilization and perceptions were collected and summarized using descriptive statistics. The relationship between the time spent using the EHR and the distinct aspects of the visit was tested using Chi-square tests of association.

Results   Provider/preceptors (n = 83) reported a negative effect of EHR on the patient–provider connection, but a positive effect on the review of medications/medical records, communication between providers, review of results with patients and review of follow-up to testing results with patients. We observed no correlation between the provider's time spent using the EHR and their perception of its effectiveness.

Those who responded that the EHR negatively affected their ability to teach (34%) were significantly more likely to also report that the EHR negatively affected their ability to communicate with the patient while taking a history (p = 0.04).

Conclusions   Providers reported a positive perceived effect of the EHR on distinct aspects of the office visit, yet they also reported a negative perceived effect of EHR on patient–provider connection. Impacts on the perceived ability of some providers to teach students were also demonstrated.

Keywords: electronic health record (EHR), EHR specific communication skills, outpatient office visit, patient–provider communication, student education

INTRODUCTION

The use of an electronic health record (EHR) by a provider during an office visit has been equated to 'texting while driving' and thus raises concerns that a provider's observation, communication, problem solving and development of trusting relationships could be impacted.[1] We agree that a person should not be texting while driving, yet what is wrong with texting in a parked car? In the second situation, the driver identified a conflict of attention and chose to stop and do one activity at a time. Can healthcare providers help identify when it is 'safe' to 'text while doctoring'?

To understand the effects of any given factor on the provider during the office visit, we must first review the cognitive tasks that a provider performs. The cognitive tasks accomplished during a medical office visit with an EHR have been described.[2] During an office visit, the provider has the important cognitive task of attending to the patient while actively using the EHR. It has been argued that all aspects of health care provider performance require cognitive processes.[3] It is evident from these diverse activities that each part of the office visit requires the provider to complete different cognitive tasks.

The role of the EHR in the current work system needs to be clarified. The functionality of the EHR has also been described.[4] Based on providers' interviews, a prediction was made that the EHR would increase the physician's mental workload and thus make the tasks of simultaneously data entry and engagement in patient centred care more problematic.[4]

It has been concluded that the introduction of the EHR into the office environment would have intended and unintended consequences on the cognitive and social dimensions of the clinical encounter[5]. It has been proposed that the performance of cognitive work mediates between the work system design and the patient, the employee, and organizational outcomes.[4] Thus, to be effective, the EHR must both enhance the performance of the diverse cognitive tasks performed during an office visit and integrate into the work system design.

The EHRs observed effect on patient–provider communication uncovered common patterns and communication was 'changed' due to the computer being in the room with novel 'time-out' periods.[6] The interviewed patients were unclear about the computer's function and what their providers were doing on the computer.

Videotaped office visits were also evaluated for determining the effects of the EHR on patient–provider communication.[7] The EHR affected visit organization, verbal and nonverbal behavior, computer navigation and mastery, and spatial organization of the room. The clinician's baseline mastery of communication skills correlated with their effective use of exam room computers (ERCs) and these skills were carried forward and affected the clinician–patient communication positively or negatively depending on provider's baseline skills.

Three distinct practice 'styles' identified through video-taped analysis have been labeled as informational, inter-personal and managerial.[8] These styles were distinguished based on the behaviors of the clinicians during real-time clinic visit progress. The author's found that clinician style determined the use of the ERC over a wide variety of behaviors, including the time spent on looking at the patient, collaborative use of the ERC screen, and types of questions asked by patients.[8] Further research using videotape analysis and focus group interviews found that providers' use and perception of EHRs were influenced by factors grouped into four categories: spatial, relational, educational and structural.[5]

Communication dynamics were also analyzed using videotapes of primary care physicians and the studied sample spent 24%–42% of the visit time gazing at the computer.[9] These findings and others have led to labeling the computer a 'third party' in the visit, as the ERC competes with the patient for the clinician's attention and diminishes patient centredness.[5,9,10] In fact, 92% of one study's participants reported that the use of the EHR disturbed their patient–provider communication.[11] This led the authors to suggest adjusting the spatial organization of the office and working on providers' communication and computer skills.

The literature clearly demonstrates the complexity of the cognitive tasks that the health care provider performs during an outpatient office visit. But how does this impact teaching students or the preceptors enthusiasm for teaching? One study found that nearly half of the faculty reported decreased enthusiasm for teaching following EHR implementation.[12]

The purpose of our study was to obtain provider/preceptor opinions regarding the effects of the EHR on distinct aspects of the office visit as well as their ability to educate students. We hypothesized that the use of the EHR may be detrimental to some aspects of the office visit and one's ability to teach, but may be neutral or even enhance other aspects of the visit. In other words, we aimed to attempt to determine when, or if, it is safe to 'text while doctoring'.

METHODS

Survey questions about experience with the EHR were developed in the fall of 2012 after reviewing previously used instruments[7,13] and adding questions about the EHR current use, length of time of EHR use, computer location, percent of time using the EHR during a patient visit, verbalization to patients of EHR use, and perceived effect on distinct aspects of the outpatient office visit and the educational experience. After expert review for content validity, we obtained approval from the Institutional Review Board for Human Subjects. We pilot-tested the surveys for clarity and ease of use with 15 volunteer providers prior to their distribution: however, we did not determine the reliability of the survey. We then e-mailed, mailed and faxed the surveys to 189 physicians and nurse practitioners who had served as preceptors for a large (562 bed), tertiary care, non-profit New England hospital's medical students or nurse practitioner students.

Statistical methods

We performed an initial descriptive analysis to characterize the study population with regard to demographics, EHR utilization history and computer location. We used Chi-square tests of association to examine the relationship between the time spent using the EHR and the distinct aspects of the office visit. Where cell count assumptions were not met for the Chi-square test, we used Fisher's exact test as a non-parametric alternative. We tested the significance of the correlation between survey questions using Spearman's correlation coefficient, which is appropriate for the analysis of ordinal response variables.

RESULTS

Provider/preceptor respondents

Of the 189 providers/preceptors to whom we sent surveys, 99 responded (52% response rate). Of these respondents, 83 indicated use of the EHR during outpatient office visits (84%). All analyses in this study are based on these 83 respondents.

The providers/preceptors reported basic information to contextualize their historical use of the EHR. The mean length of time in practice was 16.7 years with a standard deviation of 8.7 years. The reported length of time using the EHR varied from less than 1 year to more than 5 years with the majority having used the EHR between one and four years (63.9%).

We surveyed providers regarding the current location of the computer and their computer use habits. Forty-eight percent of preceptors utilized a portable laptop; 42% had a computer that was fixed on the table or wall in front of them, and 7% did not have a computer in the room. Most providers (76%) reported it was important for their patients to be able to see the screen at least some of the time and many providers (83%) further indicated that they usually verbalized to their patient what they were doing when they used the computer.

Table 1 Self-reported percent of time spent on the EHR during a full office visit and during history taking (N = 83)

	Full office visit (%)	History taking (%)
None(0%)	10.8	20.5
1% – 24%	33.7	42.2
25% – 49%	36.1	10.8
50% – 74%	13.3	14.5
75% – 100%	3.6	9.6

We requested an estimate of the percent of time that the providers used the EHR during the office visit. Respondents reported percent of the time spent on the EHR (typing only, looking at the computer screen or typing and talking) during a full office visit and during history taking (see Table 1). We additionally surveyed providers on the effect of the EHR on their ability to communicate with patients while taking a history during an office visit. Responses were mixed, with 24.1% reporting a positive or very positive effect, 30.1% reporting no effect, and 43.4% reporting a negative or very negative effect.

To address our hypothesis that the EHR will affect the different parts of the office visit differently, we asked providers to evaluate EHR use with respect to distinct aspects of the office visit. We determined the provider's perceptions of the effect of the EHR on each distinct aspect (see Table 2). In general, perceptions were positive or neutral; however, a majority of providers reported that the use of the EHR negatively impacted the patient–provider connection (70.4%).

Lastly, we analyzed the correlation between the provider's percent of time spent using the EHR during the office visit and the perception of the effect of the EHR on distinct parts of the visit (see Table 3). A positive correlation coefficient suggests that as time spent using the EHR increased, the perception of the effect of the EHR became increasingly positive. There were no significant correlations between the time spent using

Table 2 Provider perceptions of the effect of the EHR on distinct aspects of the office visit (N = 83)

	Positive or very positive effect (%)	No effect (%)	Negative or very negative effect (%)	General perception
Review of medication or medical records	87.5	8.8	3.8	Positive
communication between providers	79.0	9.9	11.1	Positive
Review of results with patients	77.8	19.8	2.5	Positive
Follow-up to testing results with patients	76.5	18.5	4.9	Positive
Teaching students	38.3	27.2	34.6	Neutral
History taking	30.9	32.1	37.0	Neutral
Patient to provider connection	<1.0	29.6	70.4	Negative

Table 3 Correlation between percent of time during a full office visit and during history taking on distinct aspects of the office visit

	Full office visit		History taking	
	corr.coefficient[a]	P value	corr.coefficient[a]	P value
Review of medication or medical records	−0.01	0.93	0.04	0.74
Communication between providers	0.12	0.30	0.16	0.16
Review of results with patients	0.04	0.73	−0.01	0.93
Follow-up to testing results with patients	0.05	0.67	0.02	0.84
Teaching students	−0.13	0.26	−0.11	0.31
History taking	0.03	0.78	0.14	0.19
Patient to provider connection	−0.16	0.15	−0.06	0.59

[a] Correlation coefficient and P value from Spearman correlation

the EHR during the full office visit and the perception of the effect of the EHR on any aspect of the visit. Results were similar and non-significant for the time spent using the EHR during history taking (see Table 3).

We performed secondary analysis to characterize those providers who reported that the EHR negatively affected their ability to teach students ($n = 28$) compared to those who responded that EHR positively affected their ability to teach students ($n = 31$). Those who responded that the EHR negatively affected their ability to teach students were significantly more likely to also report that the EHR negatively affected their ability to communicate with the patient while taking a history ($p = 0.04$). We did not observe a significant difference between these groups in the belief in the importance of the patient being able to see the computer screen during the office visit ($p = 0.77$) or in the importance of verbalizing to the patient while using the computer ($p = 0.80$).

DISCUSSION

Principal findings

Our principal findings demonstrate contrasting effects of the EHR as perceived by the provider/preceptor. We observed a perceived negative effect on the patient–provider connection in contrast with the perceived positive effects on the review of medications and medical records, the communication between providers, the review of results with patients and the review of follow-up to testing results with patients. Preceptors who reported that the EHR negatively affected their ability to teach students also reported negative effects on their ability to communicate with patients while taking a history.

The aspects of the office visit on which provider/preceptors reported positive effects provide evidence of the potential benefits of the use of the EHR by a provider during the visit when reviewing medications, medical records and results with patients. Inviting patients to view the computer could enhance the relational aspect of the patient–physician communication and foster patient activation.[14] ERCs have served as means to share decision making and increase the teaching roles of

clinicians.[15] Two different themes of patient approaches to a medical encounter with a doctor with a computer at present, dyadic (dealing primarily with the doctor) and triadic (dealing with both computer and doctor) have been recognized.[16] These authors concluded that providers need training on methods of involving the computer in the visit and also recognizing patient signals about that involvement.

We initially predicted that the percent of office visit EHR use would correlate directly with increasing difficulty with patient–provider connection (i.e. increasing negative effect due to the increasing need to multitask). Our results demonstrated that the majority of providers reported a negative effect of the EHR on patient–provider connection, regardless of percent time of EHR total use or use during history taking. We also predicted that as the percent of EHR use increased during the office visit, we would see an increasing positive effect of EHR specific tasks that do not require multi-tasking. However, the lack of significant correlations in our results demonstrated no relationship between the percent of time the EHR was used and the positive effects that were reported in this study.

Clinical work that combines communication skills with pattern recognition, clinical reasoning and problem solving skills is a mentally demanding activity.[17] It is possible that the provider/preceptors reported a negative effect of the EHR on the patient–provider connection due to the cognitive demands of multitasking data entry and extraction along with patient communication, which could lead to feelings of being ineffective at all three.[18] However, there is some evidence that providers can change their computer use behavior based on their patients' psychological needs.[19] Providers must be able to alter the computer use in response to patient cues despite the computer being a potential distraction.

Providers, who were concerned about deterioration of the provider–patient relationship prior to EHR implementation, described strategies they used to prevent this and this concern seemed to 'disappear' eight months after implementation.[15] However, part of the ability to alter behavior or style

when dealing with an ERC comes from self-awareness of current practice and consequently what is being mirrored for students. Situational awareness or one's awareness and understanding of their task-related situation becomes more impaired as cognitive workload increases.[19] Two studies have previously revealed that providers were surprised at how their ERC use looked on the video and how little they engaged the patient, and as a result wanted to change their behavior.[6,8] Perhaps the periodic review of ERC use by self or peer and patient experience is appropriate to allow providers to reflect on their ERC use outside of a high cognitive workload situation.

Future directions or implications

So how do we augment the positive effects of using the EHR during the office visit while simultaneously lessening the negative effect seen on the provider–patient connection? It was concluded by the authors of one of the largest US studies of the effect of the computer use on patient satisfaction that the solution was for providers to 'refine their multitasking skills'.[21]

Recognizing that even skilled physicians have been observed as looking predominantly at the computer during office visits, tips for practicing patient centred care with an ERC have been developed.[11,22,23] However, it has been noted that physicians developed their EHR use skills based on experience and observation rather than formal training.[24]

The office visit can be broken into distinct parts: beginning, middle and end and it has been suggested that a provider could be patient centred during the beginning of the visit (entrance, greeting and history of present illness) and then transition into use of the EHR during the middle where the EHR's information is valued by provider and patient.[23] Observed methods of managing the documentation versus attending to patient conflict have been to either burst of typing while the patient talks alternating with attending to patient or documenting directly after encounters or documenting after hours.[5]

How can we have multiple experts' EHR specific communication skill models yet still continue to have lack of implementation of these into practice? We developed RESPECTS© (see Table 4), a mnemonic for EHR specific communication skills, which follows the office visit flow, based on the above literature recommendations along with skills presented by Kaiser Permanente.[25] We also incorporated the requirement of the work system supporting cognitive performance and thus skills to reduce cognitive workload during the distinct parts of the office visit were chosen.[3,4] It has been demonstrated that medical students can be taught EHR specific communication skills to improve their communication skills and these skills are not inherent.[13]

Our provider/preceptors who reported that the EHR negatively affected their ability to teach students also reported that the EHR negatively affected their ability to communicate while taking a history. Could these providers/preceptors represent a unique 'group' that requires additional support with EHR utilization? Would the understanding of this group help our medical and nurse practitioner schools to identify preceptors whom may benefit from further EHR specific communication

Table 4 RESPECTS© method of EHR communication

R	Review the EHR prior to entering the room	Briefly review chief complaint, vital signs, problem list and recent visits if possible
E	Entrance	Greet patient, introduce self and build rapport before introducing the EHR
S	Say everything that you are doing	Verbalise all actions performed when using the EHR
P	Position of the computer	Position the computer so the patient is able to see the screen when necessary by putting the computer in the patient–provider–EHR triad
E	Engagement position	Be in the engagement position during critical conversation with the patient • Eye contact • Body fully aligned • Proper body movement • Non-distracted environment
C	Computer confidence	Value the computer, speak positively about the EHR
T	Teach	Teach the patient through use of the EHR
S	Summarise and sign out	Verbally and simultaneously provide a written summary for the patient Sign out of the computer at the end of the visit

skills use? Self-reporting of this information by provider/preceptors could be used to prioritize which instructors receive EHR specific communication skills training.

Limitations

Limitations of this study include the small sample size of the providers that were recruited. This study was also performed at one academic medical centre, although preceptors were sampled over the entirety of a small New England state. Our preceptor/providers were a mixed group of physicians and nurse practitioners, which could be seen as a limitation due to the mix or a benefit due to the diversity. Our study was also limited in that we did not identify the type of EHR used by each provider and did not examine comparisons with providers who initially stated that they did not have an EHR due to sample size limitation.

Unfortunately, we did not have information deemed essential to classify our provider's office visit environment as previously recommended.[26]

CONCLUSION

Our providers reported distinct parts of the office visit they believed they were 'pulled over and parked' and thus safe to be 'texting while doctoring'[1] while using the EHR. They helped to determine that the office visit tasks that involved the use of the EHR to actually 'review or communicate with others' were augmented, while the tasks that involved the use of the EHR on top of other cognitive tasks appeared to increase cognitive load as was predicted.[3,8,18]

Our providers reported that the EHR caused them to lose the patient–provider connection. This finding supports the previously reported 'reflections' of providers noted.[5,8] We believe that being mindful during the office visit, using EHR specific communication skills and focusing on the patient during the 'beginning of the visit' may help to overcome this effect. We also suggest that it may be possible to identify groups of providers/preceptors that may struggle with EHR utilization and benefit from additional support. Further research studies regarding the ability of EHR specific communication skills to overcome the sensation of 'texting while doctoring' negative effects by reducing multitasking while strengthening the positive effects by reemphasizing truly 'patient centred' care will need to be performed.

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Conflict of Interest

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