Computers in the examination room and the electronic health record: physicians’ perceived impact on clinical encounters before and after full installation and implementation

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Purpose. We compared physicians’ self-reported attitudes and behaviours regarding electronic health record (EHR) use before and after installation of computers in patient examination rooms and transition to full implementation of an EHR in a family medicine training practice to identify anticipated and observed effects these changes would have on physicians’ practices and clinical encounters.

Methods. We conducted two individual qualitative interviews with family physicians. The first interview was before and second interview was 8 months later after full implementation of an EHR and computer installation in the examination rooms. Data were analysed through project team discussions and subsequent coding with qualitative analysis software.

Results. At the first interviews, physicians frequently expressed concerns about the potential negative effect of the EHR on quality of care and physician–patient interaction, adequacy of their skills in EHR use and privacy and confidentiality concerns. Nevertheless, most physicians also anticipated multiple benefits, including improved accessibility of patient data and online health information. In the second interviews, physicians reported that their concerns did not persist. Many anticipated benefits were realized, appearing to facilitate collaborative physician–patient relationships. Physicians reported a greater teaching role with patients and sharing online medical information and treatment plan decisions.

Conclusions. Before computer installation and full EHR implementation, physicians expressed concerns about the impact of computer use on patient care. After installation and implementation, however, many concerns were mitigated. Using computers in the examination rooms to document and access patients’ records along with online medical information and decision-making tools appears to contribute to improved physician–patient communication and collaboration.

Keywords. Computers in medicine, doctor–patient relationship, electronic medical records, quality of care, teaching methods.
improvement. However, the majority of these studies have been post hoc surveys, with few comprising a comparative pre–post methodology.

This paper reports qualitative findings from a larger mixed methods study focussing on physicians’ perceptions of EHR use prior to and after installation of computers in examination rooms and transition to full implementation of an EHR in the Memorial Hospital of RI Family Care Center (FCC), a family medicine residency outpatient practice affiliated with the Warren Alpert Medical School of Brown University. The present paper addresses preferred styles of learning to use the EHR and targets how EHR use in the examination rooms impacts physicians’ perspectives about their interactions with patients.

In this paper, we present our two sets of physician qualitative interview results: the first prior to installation of computers in the examination room and full implementation of an EHR and the second, conducted 8 months later, after implementation was complete and when the physicians had experience using the computer resources in the examination room.

Methods

Research team

Our research team included two faculty family physicians: an MD (DA) and an MD/PhD anthropologist (JB), both of whom practice in the FCC; two PhD anthropologist faculty members, REG and RS and NW and RD (EdD in higher education and adult learning and PhD in educational research, measurement and evaluation, respectively). NW and RD conducted the physician interviews. All participants provided written informed consent. None received monetary compensation; however, lunches were provided if the interviews occurred during the lunch hour.

Participants. We interviewed 24 physicians, each on two occasions ~8 months apart: once before and once after full implementation of an EHR and installation of computers in the clinical examination rooms. Twelve of the physicians were faculty members and 12 were family medicine residents in the FCC. The residents were first interviewed during their second year of residency and again during their third year. Residents and faculty were made aware of the upcoming study and were invited to participate through presentations at group meetings and through e-mail messages. Participation was voluntary. All residents and all faculty members who see patients agreed to participate.

Instrument development. The project team developed a list of core open-ended questions for these semi-structured interviews. They were supplemented by spontaneous probes and follow-up questions to seek clarification or expansion of the participants’ responses or to explore new relevant lines of inquiry raised by the participants. The same topics were explored in both interviews. In the second interviews, however, questions were worded to encourage participants to reflect on their experience with the EHR in the 8 months between the two interviews. In addition to the specific questions on the first and second interview scripts, participants were encouraged to add observations and perceptions not addressed in the formal interview guides. Question topics and sample questions for the first and second interviews are presented in Table 1.

Data collection phases. The data were collected in two time periods: before installation of computers in the examination room and full implementation of the EHR and then 8 months later after installation and full implementation. Table 2 lists the two phases in detail.

Data collection. To maximize participants’ comfort in responding to interview questions, experienced researchers (RD and NW), who at the time of the research were not yet departmental faculty, conducted the interviews. Each interview lasted 30–45 minutes and was audio recorded. Participants were informed that the transcripts of the recorded interviews would be professionally transcribed and de-identified before being distributed to the project team. All interviews were conducted privately in faculty offices or in meeting rooms.

Data analysis. The interview data were analysed soon after the interviews were transcribed by three project team members (REG, NW and RD) using the immersion/crystallization method. Before the meetings, each person individually read the interview transcripts designated for that day’s discussion, and the data were summarized and abstracted into a spreadsheet to facilitate comparison of domains of interest among the transcripts. These summaries and spreadsheets were later discussed by the entire research team to formulate an overall thematic framework for the data analysis. Nextly, we developed, discussed and refined a code book for line-by-line coding using the qualitative data management software package, WEFT. (The list of codes is included in Appendix A, available as supplementary data in Family Practice online.) Code reports were then analyzed to develop our final interpretation of the data.

Results

Four primary themes emerged from the data and are discussed in this paper: (i) patient privacy and
Table 1 Question topics with sample questions for first and second interviews

<table>
<thead>
<tr>
<th>First: (pre-full implementation) interview questions</th>
<th>Second: (post-full implementation) interview questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Anticipated barriers to using the EHR during clinical encounters</td>
<td>1. Actual barriers to using the EHR during clinical encounters</td>
</tr>
<tr>
<td>What are some barriers and facilitators you see affecting a successful transition?</td>
<td>What are some barriers and facilitators you see as having affected the transition?</td>
</tr>
<tr>
<td>2. Perceptions of transition process</td>
<td>2. Perceptions of transition process</td>
</tr>
<tr>
<td>How do you feel about the transition period towards more complete use of the EHR that the FCC is starting to go through?</td>
<td>How do you feel the transition period went in the FCC towards more complete use of the EHR?</td>
</tr>
<tr>
<td>3. Experiences in learning to use the EHR</td>
<td>3. EHR learning experiences</td>
</tr>
<tr>
<td>How did you learn to use Logician®?</td>
<td>How did you learn to use the EHR</td>
</tr>
<tr>
<td>4. Concerns in using the EHR during patient encounters</td>
<td>4. Concerns about using the EHR during patient encounters</td>
</tr>
<tr>
<td>How do you think having the computer in the room will affect your communication with patients?</td>
<td>Have you noticed how having the computer in the room may be affecting your communication with patients?</td>
</tr>
<tr>
<td>5. Perceptions of patients’ concerns about the EHR</td>
<td>5. Perceptions of patients’ concerns of EHR</td>
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<tr>
<td>What do you perceive your patients will think about you using a computer during the visit?</td>
<td>What do your patients think about you using a computer during the visit?</td>
</tr>
<tr>
<td>6. Adaptation in using the EHR during patient encounters</td>
<td>6. Adaptation in using the EHR during patient encounters</td>
</tr>
<tr>
<td>How do you think having a computer in the room will affect your style and usual flow of delivering care?</td>
<td>How does having a computer in the room affect your style and usual flow of delivering care?</td>
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*Logician: current name Centricity®.

Table 2 First and second data collection phases

<table>
<thead>
<tr>
<th>First interviews: pre-full implementation and computer installation; January to July 2005</th>
<th>Second interviews: post-full implementation and computer installation; April to October 2006</th>
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<tbody>
<tr>
<td>No computers in the examination rooms</td>
<td>All 27 examination rooms have a computer with Internet access</td>
</tr>
<tr>
<td>10–12 computers outside the examination rooms</td>
<td>Nurses entered clinical intake in computer</td>
</tr>
<tr>
<td>One laptop available for examination rooms</td>
<td>Physicians entered all patients’ information in the computer, including patient notes and all other chart entries</td>
</tr>
<tr>
<td>Limited use of the EHR</td>
<td>No further paper records were being created</td>
</tr>
<tr>
<td>Nurses entered clinical intake on paper</td>
<td>Physicians entered all problem and medication lists on the computer</td>
</tr>
<tr>
<td>Physicians entered only problem and medication lists on the computer</td>
<td>Physicians entered all other chart entries in paper chart</td>
</tr>
</tbody>
</table>

confidentiality, (ii) physicians' skill in using the computer and the EHR, (iii) quality of patient care and (iv) physician–patient interaction. These themes will be discussed separately for the first and second interviews. We compared the findings for faculty and resident participants and found that the opinions of the two groups were highly concordant, so our presentation of the findings is combined.

First interviews findings: January to July 2005

Patient privacy and confidentiality. Possible breaches of patient confidentiality when using a computer in the examination room was a significant concern to physicians in the pre-computer installation period. Some physicians reported that their patients were worried that their health information could be compromised. Physicians shared this apprehension and anticipated problems arising. One faculty member reported,

I think people are concerned about privacy, about people finding out about them and stealing identity and stuff like that.

While another stated,

There are going to be some people who will be freaked out … It’s important that we acknowledge issues of confidentiality.

Physicians’ skills in using the EHR. EHR implementation had been long and gradual, spanning years where the EHR functions were only minimally used. The level of physicians’ skills in using the technology varied greatly early in the study.

[O]f course I [use the EHR] in updating medications and all that stuff. But I [also] actually communicate with my nurse fifteen, twenty times a day through Logician by flagging her.

I don’t use Logician for documenting the … note or the encounter. That’s my next big step. I document the medications, try to update them. I document the problem list, try to update it. I document allergies. I try to update that. I document prior directives so if there’s something like the patient has a living will or, you know, particular requirement, I try to document that. I am now doing consultations and referrals in Logician.
Quality of patient care. Some physicians predicted there would be negative effects associated with the quality of patient care. A common concern was that the physician would focus on the computer and not on the patient and that the encounter would be computer-driven, thus changing their style and pattern of care. One faculty physician reported his observation of a fellow physician using the EHR:

I notice that he goes through a litany of questions or issues, kind of runs down a laundry list . . . Is that real conversation? Is that medical information? Is that the computer driving the encounter? Or is that, you know, the encounter driving what’s in the computer? There are pluses and minuses.

Despite concerns like this, most physicians also anticipated multiple benefits from having computers in the examination room, especially related to improved accessibility of patient data. Other benefits that physicians looked forward to included eliminating problems that resulted from the often haphazard organization of paper charts, misplaced charts, missing or misfiled elements within the chart and charts in use by other physicians. Many physicians expected to see the elimination of problems created by the notoriously poor handwriting of physicians and the consequent difficulty of reading another physician’s notes. Physicians also anticipated having the ability to track and graph parameters, such as haemoglobin A1c, children’s growth curves and vital signs such as weight pulse and blood pressure, and hoped to adapt these capabilities as teaching tools to foster patients’ involvement in managing their health. As one faculty physician explained,

[I am] interested in the capacity of using the monitor screen as a teaching tool [to] show data about this is what your blood pressure has been the last year in a graph . . . .

Improved medication management including automated capability of the EHR to identify and flag drug interactions, to identify patients who are on a particular drug when there is a recall and to manage more effectively prescriptions for controlled drugs were other benefits physicians anticipated. A resident reported:

Definitely [monitoring] narcotic records which we do a lot of just to make sure a patient is not getting narcotics too frequently.

One faculty physician noted the value of prompts in preventing potential medical–legal issues arising from tests that should have been ordered but may have been missed.

Because right now we don’t have any tracking system . . . and there’s been numerous kinds of legal precedents and things that suggest that we are pretty much responsible for letting patients know when it’s time to have their tests done, or if they don’t get a test done we need to make sure they do it.

Physicians also commented on the availability of prompts in the EHR that reminded them to schedule tests they might have overlooked to help ‘keep the physician honest’. A faculty member asserted:

I think in terms of having automatic reminders, that’s great. It reminds me to bring stuff up that I might forget about . . . So I think that’s going to help to provide good patient care so I don’t forget to do—or at least mention—a screening test to someone . . . I’d rather have it pop up and ignore it than not pop up at all. Personally, I like information, and I’ll ignore things if I don’t want to use it.

Physician–patient interaction. One of the main concerns expressed by physicians regarding the presence of computers in the examination room was its possible negative effect on physician–patient interaction. A resident reported that,

. . . in real time [to] try to document a patient encounter, potentially it might take away from the doctor patient encounter.

Physicians were particularly concerned about decreased eye contact. The placement of the computer and the need to type the note might make direct and indirect contact difficult. In the words of one faculty member,

. . . rather than having steady eye contact with patients in a clinical encounter . . . I would be diverting to the screen now and then as needed, or the inability to touch a distraught patient during the interview; [it’s] an additional step that pulls me away from the more intimate encounter, the one on one personal encounter.

When charting manually, many physicians had developed an ability to write their notes unobtrusively while still interacting with the patient. They feared that this would not be possible when using the computer. Physicians also expressed concerns about patients’ reactions to their use of the computer. They predicted that patients would be offended by physicians’ typing during the encounter and that physicians would not be giving undivided attention to their patients. Physicians also expressed concern about patients’ possible negative reactions to typing the note rather than writing it by hand. One resident stated that,
... typing in front of the patients ... I don’t want them to feel like it’s impersonal or something.

Second interviews findings: April to October 2006

Patient privacy and confidentiality. After the computers had been installed and physicians had became accustomed to using them in the examination rooms, physicians’ initial worries about patient privacy and confidentiality seemed to have largely dissipated. Privacy and confidentiality were not cited as concerns by physicians in the second interviews. Instead, physicians noted that many of their patients seemed oblivious to the EHR; when patients were aware of it, they appeared to accept and appreciate it. In contrast to the concerns physicians expressed in the first interviews about patients’ perceptions, physicians at the second interview felt that patients believed that use of the EHR signified that they were getting better care.

They feel like they are getting higher standard of care because we’re computerized. [Patients] think you’re paying more attention to them. (Resident)

[Patients] love [the computer] ... I’m sure my patients would say it’s resulted in better patient care. (Faculty)

Physicians’ skill in using the EHR. Many physicians reported that they had had difficulty in learning the EHR system, although they noted that they had expected that the learning curve would be long and slow. Workflow issues that preoccupied them in the first interview were no longer mentioned in the second interview. Instead, the following comment typified physicians’ attitudes:

I didn’t feel like it slowed me up significantly initially, which I was concerned that it would. I guess we had been doing enough before that I had the routine down. You know, I think ultimately the ... final switchover wasn’t hard. (Resident)

Physicians who had to learn to be proficient using the computer in the examination room reported that they had one or two formal EHR-training sessions. However, their preferred way to learn the system was to experiment with it. They reported that the most efficient and effective way to learn to effectively use the EHR was not through formal training but to try it alone or use it with assistance from more experienced users as help was needed. These physicians noted,

[Training with technical support] was pretty useful [but] experimentation is number one and then being taught by colleagues. (Resident)

There have always been people with the skills to be able to help me. (Faculty)

I tend to just learn by kind of doing it and seeing what other people are doing. (Resident)

Quality of patient care. Anticipated benefits of more fully using the EHR on computers in the examination rooms cited by physicians in the first interviews were confirmed in their second interviews. Physicians said they appreciated the ability to track performance outcomes using the computer.

[S]ometimes if they have a question and I don’t have an answer I look it up ... right then ... talk to them about it. [It’s] helpful if somebody is there for an ER follow-up visit [to] show them the labs on the computer [and] tell them how they’re doing. (Resident)

I’ll turn [the computer] around sometimes and say you look at this while I’m typing ... They can see over my shoulder. (Faculty)

The one good thing is that if they had lab work done you can just look it up which is a lot faster because the labs are never in the chart. It takes forever to go find them. So that is faster. And that is better, and I think patients like that that you can just turn, look it up, and they’re there, and it’s faster. (Resident)

Physicians stated that more efficient access to information improved the quality of care not only in the outpatient setting but also for hospitalized patients.

[We do] not have to rely on history of the patient that might not be completely reliable because they have had a stroke or because they’re sick, or they can’t remember what dose of [medication] they’re on. (Faculty)

Physician–patient interaction. Physicians reported that while they had anticipated severe negative effects of using the EHR in the examination room on physician–patient interaction, this turned out not to occur, particularly for established patients.

That was my biggest fear ... the amount of eye contact is not as high as it used to be ... [but that] hasn’t changed much at all. (Faculty)

Some physicians reported that they were able to maintain eye contact by appropriately positioning the patient.

I always have them facing me ... and I usually ask if they mind if I’m typing, and I’ve never heard anyone say they minded. (Resident)

They can sit next to me on the bench ... They’re already in awe because that usually is a stimulus
for conversation. Like you know, oh this is great.
(Resident)

They also reported that not only had the expected benefits been realized but also the benefits had been exceeded in many cases. They appreciated the educational resources available through the EHR.

[I will] occasionally look up patient education materials and go over them in the room ... look for things on the web and show patients. (Faculty)

In addition to serving as a patient education tool, the computer in the examination room provided physicians an effective means to share the chart with patients, both to validate its contents and to enable patients to better understand and monitor their own health. Physicians asserted that use of the computer in the examination room facilitated shared decision making and collaborative treatment plans with patients. The technology allowed them to print the treatment plan and give a paper copy to the patient.

The thing I didn’t used to do but I can do now is I can turn the screen towards them so they can see what I’m writing ... I also have [handouts] right at my fingertips. I’ll click on the patient handout and [treatment plan] ... review that with them ... then print it out [with] their name on it. (Resident)

During the second interviews, physicians reported sharing more information from the chart or other educational information with patients than they had done previously and increased ability to get patients to participate in their own health care.

Summary and discussion

Our findings demonstrate that for faculty and resident physicians in one residency teaching family medicine clinic, the concerns about EHR use in the examination rooms affecting their usual style and flow of care delivery and eroding the quality of physician–patient interaction were no longer in place once the physicians had experienced full use of the EHR on computers in the examination room.

Introduction of the EHR does not seem to adversely affect the physician–patient encounter

We were not surprised that during our first interviews, most physicians expressed multiple concerns about EHR use when in the presence of the patient. The findings reflect those listed in published literature: concerns about decreased physician–patient communication, challenges for physicians learning new skills and physicians involuntarily having to change their patient encounter routines.1–9,18,19,36 Physicians, in our study, feared that this effect would be exacerbated by inadequate computer skills on the part of the staff and serious workflow interruption. They were also concerned that the presence of the computer and the EHR in the examination rooms would compromise patient confidentiality, and, ultimately, quality of patient care.

During the second interview, these concerns appear to have disappeared and apprehension about degraded patient contact and compromised privacy and confidentiality appears to have been resolved with time and familiarity with the system.

Data from the second interviews also show no physician reports of deteriorating quality of the physician–patient relationship. Physicians described a number of strategies that they put in place to work around challenges introduced by computer use to maintaining and building the physician–patient relationship. These strategies included calling the patients' attention to the computer and inviting patients to view their chart on the monitor. While the concerns of physicians interviewed seem to have disappeared between the two interviews, potential concerns remain quite real and need to be addressed by those planning to implement an EHR in their practice.

Physicians preferred to learn through hands-on practice

Physicians preferred to learn how to work with the EHR through hands-on practice and experimentation. Physicians accepted the EHR in the examination room even though they reported that learning to use it was slow and difficult. This acceptance was likely due in part to the fact that, for some time before complete implementation, computers with the EHR installed were available outside the examination room for staff use. Physicians who were more skillful EHR users were available to provide on-demand advice to those who were less adept. This enabled the less skillful users to practice and consult with those more skillful as necessary to gradually gain skill and confidence in using the EHR. This finding is borne out by those in recent studies by Denomme et al.37 and Greiver et al.38 that found that champions/problem solvers were an essential component in successful EHR implementation.

Perceived benefits outweigh perceived problems

Most physicians in our study reported in the first interviews that they anticipated multiple benefits from having computers in the room. This perception may be the result of the gradual implementation process that allowed physicians to transition into the use of the EHR at their own speed and to anticipate functions that they would be able to use in the future. The gradual pace of implementation enabled all physicians to overcome both the disadvantages and benefits of the EHR. Over time, concerns lessened as physicians’
appreciation for the benefits of the EHR evolved. In the second interviews, physicians’ reports of the benefits of easy accessibility of patients’ medical records and medical information in general were more frequent and positive than we had anticipated. This easy accessibility of patients’ medical records was also reported in a study by Aaronson et al.39 In addition, the computer in the examination room had the beneficial effect of stimulating conversation between the doctor and the patient and physicians appreciated getting automatic reminders and alerts.

The computer in the examination room enhanced collaboration in physician–patient relationship

The installation of computers and full implementation of the EHR appears to have fostered an enhanced collaborative physician–patient relationship, contrary to some expectations and fears that were voiced early in the study by our participants and found in the literature. Many physicians reported that they moved from making unobtrusive entries in the paper chart, to collaborating with the patient in making electronic chart entries and sharing chart information with them. Physicians said they were likely to share the electronic chart with the patient than they had been to share the paper chart. Physicians have also assumed a teaching role, searching the Internet in the presence of the patient for medical information and making joint health care decisions with patients. This development has suggested to some physicians an increase in patients’ ownership of their own treatment plans that has led to greater cooperation from patients in following through with their treatments.

Limitations

It is possible that the positive findings from post-computer installation interviews are a temporary outcome in that the data were collected shortly after installation of the computers in the examination rooms was completed. The findings may be due to (i) the fact that physicians no longer needed to cope with both the electronic and paper charts simultaneously, (ii) prior exposure to the EHR before computers were installed in the examination rooms could have helped smooth the transition, enabling a greater likelihood of success and (iii) the novelty of the computer in the examination room had unexpected benefits. Once the use of the computer becomes routine to physicians, it is unclear whether they would maintain the same level of enhanced sharing and partnership with the patients or the same level of acceptance of the EHR evident at the second interview. The data obtained in this study are self-reports that might differ from actual observable behaviour on the part of our physician participants. However, direct observations of clinical encounters in the examination room with these physicians, which are reported elsewhere,16 largely support our interview findings.

This study was conducted at a single clinical site and therefore, the experience of our study participants may or may not reflect the experiences of physicians at other clinical sites implementing EHR use on computers installed in examination rooms.

Lessons Learnt

When physicians and staff positively anticipate benefits of EHR use in the examination rooms, they demonstrate a willingness to work through their initial fears and concerns to adapt to the new electronic system. Physicians using the EHR on computers in the examination rooms appear to take on a role that fosters a more collaborative physician–patient relationship. They perceive themselves to assume a teaching role, searching the Internet for medical information and making joint health care decisions and treatment plans with patients. This collaboration may foster higher engagement of patients regarding follow-up with their own treatments.

Suggestions for future research

The findings in our study suggest three areas for future research: (i) partnership with patients as facilitated by computer use in the examination room, (ii) EHR teaching and learning and (iii) residency training in use of EHRs. Future studies can explicate the nature and the effects of computer use in the examination room on patient engagement and health outcomes. The study has also indicated that physicians may prefer to learn to use the EHR through trial and error and experimentation rather than through formal training. Additional research is needed to identify the most effective ways to learn to use the EHR under differing medical service conditions. At the second interviews, most participants indicated that they had accepted the EHR as an integral part of their daily practice of medicine and they had come to appreciate its advantages. It would be instructive to determine in future research how the perceived advantages of the EHR persisted or waned with more time following the initial excitement surrounding installation of the computers in the examination room. In addition, the residents who participated in this study became more seasoned physicians between the two sets of interviews and have become yet more experienced in the years since graduation from residency. Follow-up research with these former residents to explore their experience in using an EHR in independent practice would provide further insights into the efficacy and requirements of EHR training methods in residency.

Supplementary material

Supplementary material is available at Family Practice online.
References


