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HEALTH INFORMATICS J 2007; 13; 105
DOI: 10.1177/1460458207076466

The online version of this article can be found at:
http://jhi.sagepub.com/cgi/content/abstract/13/2/105

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Health Informatics Journal

Vol 13(2): 105–118 [1460-4582(200701)13:2; 105–118; DOI: 10.1177/1460458207076466] www.sagepublications.com

The influence of electronic medical record usage on nonverbal communication in the medical interview

John M. McGrath, Nedal H. Arar and Jacqueline A. Pugh

This study examined nonverbal communication in relation to electronic medical record (EMR) use during the medical interview. Six physicians were videotaped during their consultations with 50 different patients at a single setting Veterans Administration Hospital. Three different office spatial designs were identified and named 'open,' 'closed' and 'blocked'. The 'open' arrangement put physicians in a position to establish better eye contact and physical orientation than did the alternative 'closed' and 'blocked' office configurations. Physicians who accessed the EMR and took 'breakpoints' (short periods of no computer use and sustained eye contact with patients) used more nonverbal cues than physicians who tended to talk with their patients while continuously working on the computer. Long pauses in conversational turn taking associated with EMR use may have positively influenced doctor–patient communication. High EMR use interviews were associated with patients asking more questions than they did in low EMR use interviews. Implications for medical education and future research are discussed.

Keywords

electronic medical record (EMR), nonverbal communication

Introduction

The electronic medical record (EMR), a computer system for storing, organizing, and retrieving information about patients, holds enormous promise for improving the quality of healthcare. For example, the EMR can include compulsory fields such as 'reason for visit', 'reason for prescribing', and 'dosage' that can lead to improvements in the accuracy and

completeness of medical data [1]. Electronic records have also been shown to be more understandable and fully legible than paper records. Prescriptions can be sent electronically to pharmacists or printed out for patients, helping to reduce medical errors associated with difficult to read handwritten prescriptions [2, 3]. Other benefits include on-screen reminders that help reduce the time it takes for physicians to adopt practice guidelines, and the electronic sharing of medical information among multiple specialists treating the same patient [4, 5]. Purchasing an EMR system can even result in a positive financial return on investment for healthcare organizations [6].

Despite its advantages, many healthcare organizations have been slow to adopt this new technology. Cost is one barrier, but another concern is the negative impact it may have on doctor–patient communication [7]. In this article, we examine how EMR use influences doctor–patient communication by focusing on the nonverbal dimension of interactions.

Understanding how the EMR influences communication during the medical interview is important because we know that better doctor–patient communication leads to improved healthcare outcomes [8–10]. Previous research has suggested that a physician's use of a computer during consultations can influence the communicative dynamic in a variety of ways. For example, physicians using EMRs have been observed to adopt a more active role in clarifying information, asking questions and ensuring the completeness of the record, but were less likely to explore psychosocial/emotional issues such as how health problems affect a patient's life [11]. EMR use helped physicians with information-intensive tasks but made it harder to focus attention on relationship-oriented aspects of communication. When compared to the use of the traditional paper record, EMR use also caused a disruption in the temporal sequence in the way in which patients explain their illnesses, a chronology that may be important for diagnosis [12]. On the other hand, EMR use was correlated with better physician explanations of diagnoses and treatments, and more positive perceptions of patient involvement in decision-making [13].

Other research has highlighted the importance of physician training and ongoing technical support, noting that physicians who are less comfortable with new technologies or have fewer experiences using computers may turn out to be reluctant or less effective EMR users. One recent study indicated that physicians who possess stronger baseline computer skills before using the EMR are much more likely to reap the communicative benefits of the EMR than physicians with initially weaker computer facilitation skills [14].

Since EMR use very likely will continue to grow, we need more research about how to use this new technology effectively and how to overcome or mitigate any potential problems. Interestingly, previous research has emphasized the verbal dimension of communication and no studies have focused on the nonverbal effects of EMR use. Although verbal and nonverbal communication are inextricably linked, isolating nonverbal dimensions in the medical interview can produce useful information, as it has in previous research that has dealt with aspects of nonverbal behavior unrelated to EMR use.

Nonverbal communication

Well before the advent of the EMR, researchers documented the importance of nonverbal communication in the medical interview. For example, physicians' nonverbal skills have been associated with outcome variables such as patient satisfaction, patient recall of medical information, compliance with keeping appointments, and compliance with medical

regimens [10, 15–19]. Physicians' indirect or broken eye contact and indirect facial orientation have been associated with less patient disclosure [20], a finding particularly relevant to our understanding of patient participation and one that has possible implications for EMR research.

Based on previous nonverbal research, we speculated that when physicians access computers while talking with their patients they may have difficulties maintaining the speech regulation signals that are normally associated with good nonverbal communication. For example, we know that nonverbal immediacy cues such as sustained eye contact, close proxemic distancing, forward lean, and direct body orientation indicate social readiness, availability for communication, positive affect, and liking [21–24]. Nonverbal immediacy cues are also linked with feelings of emotional support and reflect active involvement in the conversation, which are important components of communication competence [25–27]. At minimum, accessing a computer during interactions involves a break in eye contact, and we suspect it may also affect other immediacy cues, such as those related to body positioning and spatial arrangement.

However, more information is needed that fully describes how the EMR affects the human dynamics of the medical encounter. Our purpose here was to conduct a qualitative, observational study that would help describe and interpret how EMR use influences the multiple dimensions of nonverbal communication in the medical interview. More specifically, our purpose was to answer the following research question:

> RQ1: How does a physician's use of the EMR influence the physician's nonverbal communication with a patient during a medical interview?

Method

Participants

We videotaped 50 internal medicine clinic encounters with six staff physicians at a Veterans' Administration hospital in the US Southwest.

Physicians

Four of the six physicians were female and each physician had been practicing for at least 8 years. The average number of interviews videotaped per physician was eight (range 3–12, SD 3.2).

Patients

Patients were recruited as a convenience sample out of all patients attending the clinic during the data collection phase of the study. Most of the patients were male (95%) because the majority of VA patients are male, and their mean age was 64.5 years (range 40–86, SD 13.4). The mean number of years the patients had seen their provider prior to the videotaped visit was 4.8 years (range 3–5.75, SD 0.74), with the exception of one patient who was new to the physician but had been treated by other physicians in the hospital. Patients came to the clinic for a wide variety of reasons, such as diabetes, high blood pressure, cardiovascular diseases, and depression. Allergy and nasal congestion problems, arthritis, and pain centralized within patients' legs, hips, and joints were less frequent.

Procedure

Prior to videotaping the interviews, physicians read and signed a consent form approved by the hospital's Institutional Review Board. Patients were asked to participate as they waited to see their doctor, and read and signed a consent form at that time. Participants were informed that this study was designed to explore informational needs during the medical interview, but they were not told that doctor–patient communication and the use of the EMR was the focus of the analysis. This was done to minimize the risk of participants changing their communication behaviors during the interview. It is also important to note that previous research on the medical interview has shown that participants typically are not influenced by the presence of a video recorder and tend to forget about the camera because they are too busy or involved with their activities to worry about it [28, 29].

Data collection and analysis

Data were derived from unstructured observations that were made independently by two observers who then developed themes and linked them to identified dimensions of nonverbal behavior [30]. In order to operationalize the meaning of *nonverbal communication* we reviewed the literature and identified the common, general categories of signals that encompass nonverbal messages, which include:

1 *Kinesics:* visual bodily movements, including gestures, facial expression, trunk, and limb movements, posture, gaze, and gait.
2 *Vocalics or paralanguage:* use of vocal cues other than words themselves, including such features as pitch, loudness, tempo, pauses, and inflection.
3 *Physical appearance:* features such as clothing, hairstyles, cosmetics, fragrances, and adornments.
4 *Haptics:* use of touch, including the frequency, intensity, and type of contact.
5 *Proxemics:* use of interpersonal distance and spacing relationships.
6 *Chronemics:* use of time as a message system, including such code elements as punctuality, waiting time, lead time, and amount of time spent with someone.
7 *Artifacts:* manipulable objects and environmental features that may convey messages from their designers or users [21].

We defined EMR use as any contact with the computer during the consultation, regardless of whether physicians were talking or not. With these definitions in mind, two observers took detailed field notes of each interview, focusing on how physician EMR use influenced nonverbal communication. This inductive approach is analogous to ethnographic observational fieldwork, with the added advantage of being able to pause or rewind the tapes in order to write out specific impressions that are vital to the so-called 'thick descriptions' of qualitative research [28, 31, 32]. Using two observers enhanced the validity of the observations, as researchers later were able to crosscheck each other's findings and eliminate inaccurate interpretations [30, 33, 34].

After taking notes, observers first worked independently by following a content analytic procedure that calls for a movement from the specific to the general [35, 36]. Observers began by examining the details of their notes, and then identified patterns or similarities

in their observations among the interviews. Each observer then named general themes of nonverbal behaviors, and classified the themes according to the nonverbal categories identified above (i.e. kinesics, proxemics, etc.).

An initial comparison between general categories of nonverbal behavior revealed strong agreement between the two observers. Both observers concluded that kinesics (themes: physical orientation, gaze and gestures), proxemics (theme: distance between doctor, patient and EMR), chronemics (theme: time using the EMR), and artifacts (theme: EMR location and office setup) were related to the ways in which physicians used the EMR. One observer also included the vocalics category, but neither included the categories of physical appearance or haptics. The results of this initial comparison showed that observers agreed on six out of the seven nonverbal categories.

Subsequent discussion revealed that one observer included vocalics because of the relevance of pausing; the other observer grouped pausing with chronemics and did not include the vocalics category. Since pausing is related to the use of time and since the other elements of vocalics (i.e. pitch, loudness, tempo) were not identified by either investigator to be associated with EMR use, we decided to group pausing with chronemics. This adjustment resulted in full agreement on the nonverbal categories that help explain the EMR's impact on nonverbal communication.

In summary, we agreed that four of the seven nonverbal categories identified by Burgoon and Hoobler [21] were associated with EMR use (kinesics, proxemics, chronemics and artifacts) and three categories were not (vocalics, physical appearance and haptics). This comparison provided a starting point for organizing our discussion of the more detailed impressions made by each observer. We then pooled our notes, discussed all of our observations and agreed on a number of other conclusions.

Results

Time spent using the EMR

One of the first nonverbal dimensions both observers noticed related to the time spent using the EMR, which seemed to vary considerably among physician interviews. In most interviews, physicians used the EMR extensively and it appeared to be an integral part of the interview, but in a discernible minority of interviews physicians spent very little time at the computer and the EMR appeared to have little or no role in the interaction. We decided to time all interviews and determined the average interview length to be 22.6 minutes (range 5–47, SD 8.9). We then determined how much time physicians spent using the EMR in each interview and found that in 13 out of 50 interviews the EMR was used for 2 minutes or less; this was less than 10 per cent of their average interview length. In the remaining interviews, physicians used the EMR for at least 5 minutes and an average of 11.35 minutes (range 5–27); this was approximately 50 per cent of the average interview time. Based on these observations and calculations, we labeled these two groups 'high EMR usage' and 'low EMR usage.' This division helped us focus our attention on the 37 interviews in which substantial use of the EMR occurred. Further analysis showed that four out of six physicians conducted both high and low use interviews, and none conducted only low use interviews, suggesting that the time using the EMR was not physician dependent.

Physical orientation

In comparing our observations of the 37 high EMR use interviews, we found that EMR use was influenced by nonverbal communication related to kinesics, particularly the physicians' physical orientation or body positioning. In order to access the EMR, physicians physically oriented themselves toward the computer rather than the patient, and spent a considerable time in this position. Not surprisingly, computer use caused a reduction in doctor–patient eye contact and gestures, and an increase in the amount and length of pausing during interactions. We also concluded that the doctors' physical orientation depended on the location of the EMR in relation to the physician, the physician's desk and the patient's seating arrangement. It was apparent that spatial arrangement (proxemics) and desk/chair location (artifacts) also played an important role in the interviews. Among the 37 high EMR use interviews, 20 interviews fell into the first and most common condition, where the EMR was located on the left side of the physician's desk (from the physician's vantage point) and patients were seated just to the left of the desk, facing forward, so that they were positioned in an approximate 45 degree angle toward the physician. Even though the physicians were physically oriented toward the computer, patients remained in their general field of vision.

In the second condition, which occurred in 13 interviews, the EMR was situated to the right side of the desk and the patient's chair was away from the desk, closer to the middle of the office. The impact of this different arrangement was that physicians had to turn their backs on patients in order to access the EMR. This also involved moving farther away from their patients than in the first condition, and it was the only arrangement in which patients remained totally outside the physicians' field of vision during EMR use.

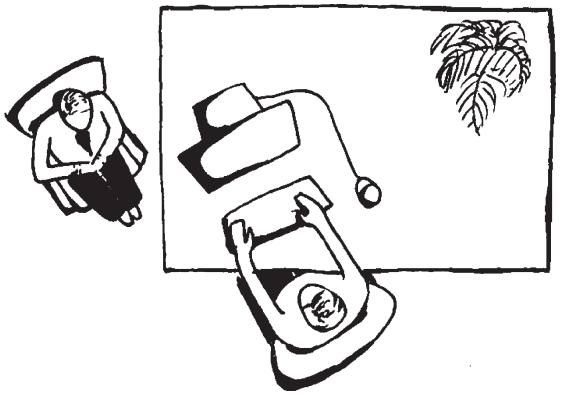
The final condition occurred in only four interviews, and was one in which the EMR was positioned toward the right side of the desk, with the patient seated to the right of the desk but behind the EMR. In this case, the EMR was blocking the field of vision between physician and patient.

We labeled the first condition *open*, the second condition *closed*, and the third position *blocked*. Figure 1 provides illustrations of each of these office arrangements, depicting how the physicians' orientation toward their patients would change depending on the arrangement of the office.

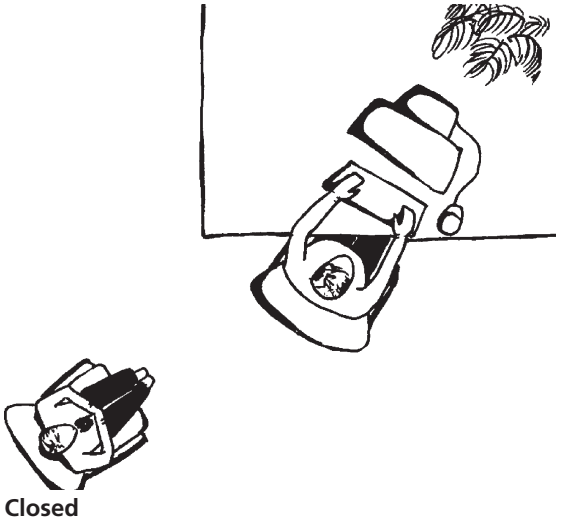
In summary, kinesics (physical orientation, eye contact), artifacts (arrangement of the EMR, desk and seating), and proxemics (movements within the space) worked in concert to produce noticeable differences in doctor–patient nonverbal communication.

Breakpoints

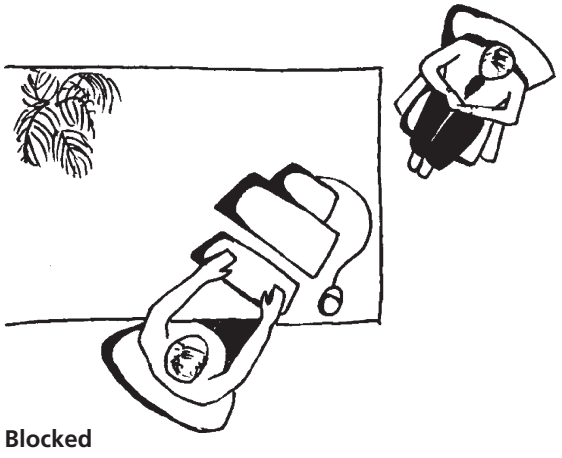
We also observed that EMR use had an additional effect on physician gaze, gestures, and head nodding. As physicians oriented themselves to the computer, they had to break eye contact with their patients, which amounted to a clear interruption in what one would might consider a normal flow of interpersonal communication. Observers documented a pattern in the way in which physicians managed this process. In some cases, physicians accessed the needed information from the computer, stopped, physically turned toward the patient, established eye contact and engaged the patient in further verbal interactions before again accessing the EMR. These pauses, or clear separations between the physicians' attention to the computer and attention to the patient, were labeled *breakpoints*.



Open



Closed



Blocked

Figure 1 Spatial arrangements (illustrations by Brittany Power)

Breakpoints allowed for better eye contact and more head nodding and gestures than cases where physicians tended to talk with their patients while continuously working on their computers. Sustained face-to-face interaction enabled physicians to use the natural nonverbal indicators that suggest attention or understanding. On the other hand, in verbal exchanges without breakpoints, observers described physicians as 'fixated on' or even 'glued to' their computers. In as much as physician eye contact and body positioning are indicators of patient interest, the potential negative effects of continuously focusing on the computer while talking to patients were readily apparent.

Physician pausing

When physicians accessed the EMR it inevitably caused silent pauses in interaction turn taking that initially were considered to be a negative nonverbal aspect of EMR use. However, further scrutiny did not reveal any obvious nonverbal indicators that patients were frustrated with these long pauses, such as restlessness, sighing, fidgeting, or looking around the room. In fact, patients appeared relaxed during these pauses and often made comments or asked questions that the silence seemed to facilitate. Our observation was that EMR use appeared to slow down the medical interview, which perhaps gave patients more time to talk and ask questions about their illness.

To explore this observation we compared the high versus low EMR use groups, and noted that the high use group indeed had longer interviews. The average time for interviews with high EMR usage was 24.7 ± 8.2 minutes ($N = 37$), compared to 17 ± 8.9 minutes for interviews with EMR low usage ($N = 13$; $t(19) = 2.74$, $p < 0.01$). We also coded patient questions as either 'illness related' or 'not illness related', and counted the number and type of questions patients asked in both the high EMR use and the low EMR use groups. We found that patients asked significantly more questions in the high EMR use group (high EMR use questions $M = 8.4$; low EMR use questions $M = 2.9$; $t(44) = 4.19$, $p < 0.01$), and their questions tended to focus on their medical condition (high EMR use illness questions $M = 5.2$ out of $M = 8.4$; low EMR use illness questions $M = 2.0$ out of 2.9). However, the number of physicians' questions did not differ significantly between the two groups (high EMR use questions $M = 31.2$; low EMR use question $M = 36.1$), bolstering the idea that additional patient participation was related to what the physicians did nonverbally (i.e. access the EMR) and not what they said.

However, we could not conclude that EMR use caused longer interviews and more patient questions, as our research design was primarily descriptive and we did not control for other possible intervening variables. Our additional analysis reflects an association that lends support to our observation that pausing appeared to have a positive rather than a negative communicative effect.

Low EMR use observations

In the 13 low EMR use interviews (EMR use < 2 minutes), which included four interviews in which the EMR was not used at all, the EMR was in the room in every case, but the reasons for low or no use were unclear. In three of those cases the computer was not turned on and in one case the physician tried to turn it on but the computer apparently did not work. In all 13 cases, the physician used a written chart or record, and pauses for note taking did not seem to interrupt the flow of the interaction and were much shorter

(only a few seconds) compared to the longer pauses in the high use EMR interviews. We also observed that physicians were able to sustain their physical orientation toward the patient throughout the interviews. For example, in six of the 13 low EMR use interviews the office setup was consistent with the 'closed' condition described earlier, but physicians simply turned toward the patient and were able to take notes on the desk or in their laps while maintaining their physical orientation toward their patients.

Discussion

Electronic medical records are the wave of the future. It seems inevitable, because of the many benefits mentioned earlier, that more and more doctors will permanently file their paper charts. If EMR usage means better health outcomes for patients, as a number of studies suggest, then researchers should address the doctor–patient communication concerns and ways to overcome them.

In terms of spatial considerations, it seemed self-evident that the 'open' arrangement was the most conducive for effective communication. It was the arrangement where the EMR did not obstruct the visual field between doctor and patient and required the smallest adjustment in physical orientation to establish face-to-face communication with patients. Physicians and patients were positioned at a 45 degree angle and also physically sat closer to one another in the open condition than they did in the blocked or closed conditions. Physical orientation at approximately 45 degrees, eye contact, and close proxemic distancing are nonverbal immediacy cues that previously have been linked to perceptions of interest, liking, trust, and emotional support [22–24, 37].

The open condition may also make the computer screen more accessible to patients. In six of the open condition interviews, we observed physicians asking patients to view the patient record in order to reinforce something the physician was saying, which patients were able to do by leaning forward or by the doctor swinging the computer screen toward the patient. We did not observe this behavior in any of the other interviews in this study. From the patient's perspective, the computer screen represents another nonverbal channel for gaining information, clarifying the record, and supplementing verbal messages from the doctor. Allowing patients to view their own record is also another way for patients to participate in the consultation.

Although the potential benefits of the open arrangement seemed obvious, especially when compared to the closed condition, the surprising part was that nearly half (46%) of the high use interviews were conducted with closed or blocked arrangements. It could be that the importance of office arrangement with respect to the EMR was simply overlooked, particularly since the closed and blocked exam rooms were easily changed to the open arrangement after this study was completed. We do not know if other EMR equipped hospitals would have a similar percentage of exam rooms with poor configurations, but we have no reason to believe that the problem was endemic to this hospital. Perhaps most importantly, our observations call attention to the relevance of spatial considerations and suggest how readily office arrangements can be improved.

Another instructive finding from the study involved a nonverbal pattern that we termed 'breakpoints', or situations in which physicians had noticeable, clear separations from working on the computer to focusing attention on the patient. The advantage of using

breakpoints was that it allowed physicians to engage in sustained eye contact, head nodding, gestures and verbal utterances such as 'mhm' that are naturally a part of face-to-face communication. Sometimes referred to as *back channel* communication, these nonverbal cues help regulate turn taking, and indicate attention, listening and understanding [38]. Studies also show that physicians who engage in more patient-directed gaze are more accurate at recognizing the patients' degree of psychosocial distress and get more psychosocial information from patients [39], which is precisely the type of information loss that has been associated with EMR use [11].

By contrast, talking with patients while continuously working on the computer may eliminate the many benefits of nonverbal signals that give meaning to messages and show empathy for the patient's point of view and circumstance. The potential pitfalls of fixating on the computer were quite apparent and we believe physicians could easily recognize this problem too. Again, awareness of this behavioral tendency may be enough to motivate physicians to develop their use of breakpoints and improve their eye contact with and gestures toward patients.

However, using the EMR necessarily involves changes in eye contact, physical orientation toward the computer, and the time it takes to access and input information. As physicians typed on their keyboards and searched for appropriate screens, we became interested in what patients were doing during these pauses in verbal interactions. Although we had no way of knowing how patients actually felt during such pauses, they did not exhibit nonverbal signals that would suggest unease, frustration, or boredom. Rather, they often filled the silence by asking questions related to their medical condition. We viewed this as a positive communicative outcome in the sense that more patient participation in the form of additional questions bodes well for the overall quality of the interaction.

As noted earlier, our observations and interpretations require tentative conclusions because we did not assess causation or ask physicians and patients how they would interpret pauses associated with accessing the computerized record. However, our analysis provides some evidence of an association between EMR use and patient participation, and may suggest how EMR use presents opportunities for patient involvement. When compared with the low EMR use group, the high EMR use group had longer interviews in which patients asked more questions, although the number of questions asked by physicians in both groups was not significantly different.

It could be that pausing and reduced eye contact ease the tension that patients may feel when communicating with their higher status and sometimes intimidating physicians. One of the goals of patient-centered care is to reduce such status distinctions by making patients feel more psychologically comfortable in the interview [40, 41]. Most physicians would probably agree that patients who are intimidated might become anxious or reluctant to communicate. One element of status is time and control over time. For example, patients wait in waiting rooms to see their busy physicians and then enter exam rooms and often continue waiting. If the doctor appears to be in a hurry during the interview, patients may become anxious and forget or discount topics they wanted to cover. As the doctor pauses to work on the computer, eye contact is disengaged, and the performance pressure unintentionally administered by the high status person in charge is suddenly eased. In this scenario, it is quite plausible that patients are able to think of or remember additional questions. Inadvertently, patients may gain a small measure of control over how time related to EMR use is spent.

Our observations regarding a possible link between EMR use and patient participation are worth pursuing. Although efforts to get patients more involved in consultations have had some success, it appears that in most cases doctors still dominate the conversation and patients often do not speak up. For example, in one qualitative study only four out of 35 patients were able to voice all of their concerns to their physicians in such important areas as their willingness to take prescription drugs [42]. Others have documented that although the initiative to promote patient participation and shared decision-making has successfully spread across academic institutions and is supported by consumer advocate organizations, in the reality of everyday practice it remains a relative rarity [43]. In one sense, the EMR may serve as a technological intervention that allows for more patient involvement in the form of additional questions.

Implications for physician training

As the association between effective doctor–patient communication and improved healthcare outcomes has become well documented, medical schools in many parts of the world are now required to offer communication courses in order to receive accreditation [44]. Indeed, communication skills training can have a tangible and positive effect on patient health [45]. Given the potential for EMR use to influence interactions, physician training should include a unit that focuses on the EMR. Improved communication and the effective use of the EMR may translate into better diagnoses, fewer medical mistakes, and stronger doctor–patient relationships.

We recommend a unit that would combine the EMR's technical features and benefits with a discussion on the possible negative effects on doctor–patient communication and ways to overcome them. Hands-on training could demonstrate the best physical arrangement of the room and exercises could help doctors practice breakpoints and effective back channel communication.

Physicians should also be encouraged to think of their time spent using the EMR not so much as a disruption in the process, but as an opportunity for their patients to consider anything else they might want to ask or say. Patient-centered care may involve spending more time with patients as well as a willingness to give up some control over time, but the potential payoffs related to effective communication such as patient satisfaction, compliance, safety and ultimately improved healthcare outcomes seem well worth the effort. The EMR can be an ally and not an obstacle for improving communication. This idea alone may help to alleviate concerns about adopting this technology based on negative perceptions of how it might influence doctor–patient interactions. In the final analysis, effective communication will require a delicate balance between attention to the EMR and face-to-face interaction with patients.

Limitations and future directions

Because of the limited sample with a specific physician and patient population, the results of this study cannot be generalized to all doctor–patient encounters. However, our purpose was to provide a qualitative account of physician nonverbal behaviors related to EMR use, and future research could use the themes and categories identified here to study the topic

with wider populations and different research designs. For example, a controlled experiment could further test our observations that EMR use may be linked to patient participation, or a future study could measure patient perceptions of physicians who have been trained or untrained in the effective use of EMR. Future qualitative approaches may include research interviews with physicians and patients to garner their experiences and perceptions of the influence of the EMR on nonverbal and/or verbal communication.

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