Electronic medical record use and physician–patient communication: An observational study of Israeli primary care encounters

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Abstract

Objectives: Within the context of medical care there is no greater reflection of the information revolution than the electronic medical record (EMR). Current estimates suggest that EMR use by Israeli physicians is now so high as to represent an almost fully immersed environment. This study examines the relationships between the extent of electronic medical record use and physician–patient communication within the context of Israeli primary care.

Methods: Based on videotapes of 3 Israeli primary care physicians and 30 of their patients, the extent of computer use was measured as number of seconds gazing at the computer screen and 3 levels of active keyboarding. Communication dynamics were analyzed through the application of a new Hebrew translation and adaptation of the Roter Interaction Analysis System (RIAS).

Results: Physicians spent close to one-quarter of visit time gazing at the computer screen, and in some cases as much as 42%; heavy keyboarding throughout the visit was evident in 24% of studied visits. Screen gaze and levels of keyboarding were both positively correlated with length of visit ($r = .51$, $p < .001$ and $F(2,27) = 2.83$, $p < .08$, respectively); however, keyboarding was inversely related to the amount of visit dialogue contributed by the physician ($F(2,27) = 4.22$, $p < .02$) or the patient ($F(2,27) = 3.85$, $p < .05$). Specific effects of screen gaze were inhibition of physician engagement in psychosocial question asking ($r = -.39$, $p < .02$) and emotional responsiveness ($r = .30$, $p < .10$), while keyboarding increased biomedical exchange, including more questions about therapeutic regimen ($F(2,27) = 4.78$, $p < .02$) and more patient education and counseling ($F(2,27) = 10.38$, $p < .001$), as well as increased patient disclosure of medical information to the physician ($F(2,27) = 3.40$, $p < .05$). A summary score reflecting overall patient-centered communication during the visit was negatively correlated with both screen gaze and keyboarding ($r = -.33$, $p < .08$ and $F(2,27) = 3.19$, $p < .06$, respectively).

Discussion: The computer has become a ‘party’ in the visit that demanded a significant portion of visit time. Gazing at the monitor was inversely related to physician engagement in psychosocial questioning and emotional responsiveness and to patient limited socio-emotional and psychosocial exchange during the visit. Keyboarding activity was inversely related to both physician and patient contribution to the medical dialogue. Patients may regard physicians’ engrossment in the tasks of computing as disinterested or disengaged. Increase in visit length associated with EMR use may be attributed to keyboarding and computer gazing.

Conclusions: This study suggests that the way in which physicians use computers in the examination room can negatively affect patient-centered practice by diminishing dialogue, particularly in the psychosocial and emotional realm. Screen gaze appears particularly disruptive to psychosocial inquiry and emotional responsiveness, suggesting that visual attentiveness to the monitor rather than eye contact with the patient may inhibit sensitive or full patient disclosure.

Practical implications: We believe that training can help physicians optimize interpersonal and educationally effective use of the EMR. This training can assist physicians in overcoming the interpersonal distancing, both verbally and non-verbally, with which computer use is
1. Background

The past decade has transformed the technology of information exchange, and consequently, how modern society records, organizes, archives, and retrieves information. Within the context of health care delivery, one manifestation of the information revolution is the increasingly commonplace use of the electronic medical record (EMR) [20]. This is particularly evident in Israel and Europe. Current estimates suggest that EMR use by Israeli physicians is now so high as to represent an almost fully immersed environment, leading the world in this technology [14]. In 2003, more than 4.6 million PC patient records were entered by nearly 5000 PC physicians (Family Medicine, Internal Medicine, Pediatrics, and OB/GYN) in the 4 major ‘Sick Funds’—HMO’s [29,12]. The Israeli health care system currently uses an integrative system (Ofek by dBMotion) that connects the largest HMO (Clalit) with three major hospitals (Sheba, Rambam, and Haddasa) and the Israeli Defense Forces (IDF). Over 60% of the entire Israeli health care system is planned to be connected in this way by the end of 2005 [1].

Europe also has high rates of EMR use. In 1995, 80% of primary care physicians in the UK worked in computerized facilities and over 60% were using the EMR during the consultation; 70% of Danish General Practitioners used EMR, 60% in Sweden and 40% in the Netherlands [2]. In contrast, only 5–15% of practices in the US use EMR [3,4], although their widespread may be anticipated in the near future [6].

The use of hundreds of unique EMR software programs in the US has complicated and slowed the dissemination process [32], as well as concern for potentially negative effects of computer use on the delivery of care. Concerns about increased cost, lengthened visit time, additional training needs, and treatment inflexibility have been raised [19,13] as well as potential privacy and confidentiality breaches that may inhibit disclosure of sensitive information and diminish rapport [23,33]. Despite these concerns, there is little evidence that EMR use has an adverse effect on physician and patient satisfaction [11,30] and some evidence that it is perceived positively by both patients and physicians as enhancing overall quality of care [17,21,15].

Empirical examination of actual EMR use through direct observation has provided some insight into its effect on communication dynamics. An early study in the area by Greatbatch et al. videotape-recorded physicians newly adapting to EMR use [13]. Physician behavior was described as “pre-occupied” with attention largely focused on the computer monitor and only intermittently at the patient. Moreover, the visits were characterized by frequent periods of silence and minimized or delayed verbal engagement with patients. In a similar vein, Warshawsky et al. reported a change of physician work style from ‘conversational’ to ‘block’ style and a reduction in interaction time when using the computer [33].

More recent reports have documented the tension between control of the EMR process and conduct of the medical interview. For instance, Patel et al. analyzed the interaction of 2 physicians, one an intermediate-level EMR user and the other an expert user, each with 10 of their patients [22]. The less experienced physician was strongly influenced by the order and organization of information presented by the EMR on the screen when asking patient questions and entering data while the expert physician showed greater flexibility in his interviewing style by moving back and forth between sections. Moreover, the verbal exchanges of the expert physician and his patients largely matched his actions on the computer while those of the less experienced physician did not. It is perhaps this cognitive mismatch between dialogue and computer action that accounts for the description of distracted dialogue referred to earlier.

Another small observational study of 10 general practitioners, characterized as frequent or habitual users of EMR, was conducted by Booth et al. to further explore variation in physician styles of EMR use [7]. Based on an analysis of one selected patient encounter for each of the physician participants, three distinct styles of EMR use were identified: the controlling practitioner who directs the patient not to interrupt during computer use; the responsive/opportunistic practitioner who makes use of gaps in the conversation to glance at the computer; and the ignoring practitioner who is so engrossed in the computer task that he ignores patient comments. The authors conclude that without specialized training, the simultaneous demands of computer and patient interaction may result in cognitive overload with consequences for sub-optimal computer use, as well as periods of clinical inattentiveness to the patient.

While the preceding studies either compared the effect of EMR expertise or level of EMR use during a visit on communication dynamics, Makoul et al. directly compared the communication of physicians practicing in the same clinic who use either the EMR or paper charts [16]. Six physicians and 204 of their patients were delivering care in the same urban, academic medical center, 3 experienced in EMR use, and 3 who have continued to use paper charts. Findings of the study suggest that use of the EMR strengthened the physician’s ability to complete information
tasks, but tended to reduce his/her attention to more patient-centered aspects of patient communication, including outlining the patient’s agenda and exploring psychosocial and emotional issues.

Using a somewhat different methodology to study physician style in EMR use than the others described above, Theadom et al. videotape-recorded four general practitioners using an EMR while consulting with an actor simulating a patient [31]. The Roter Interaction Analysis System (RIAS) system was applied to the study videotapes to capture patterns of verbal communication and supplemental coding of eye contact, head nods, smiling, and forward lean, was used to characterize non-verbal behavior. Differences were observed in both verbal and non-verbal measures in relation to user style. The two minimal users were characterized as more patient-centered, both verbally and non-verbally in their consultation style, than the more extensive users. However, the extensive use physicians were more evidence-based in their practice, with more complete elicitation and documentation of patient information, and conducted visits in a more logically flowing manner.

The current study extends the inquiry of these earlier studies in several ways. First, the investigators developed a Hebrew translation of the RIAS and this study presents its first application and an assessment of its cultural adaptability and suitability to the context of Israeli primary care. Secondly, because the EMR has become standard practice in the Israeli medical system, variation in levels of individual physician use of the EMR and its impact on patient–physician communication was of interest. Based on earlier studies suggesting that levels of EMR use were inversely related to interpersonal engagement and indicators patient-centeredness, both verbally and non-verbally, the RIAS was applied to the study videotapes. In addition, indicators of computer use were coded, including the number of seconds the physician gazed at the computer screen and levels of active keyboarding. It was hypothesized that keyboarding and screen gaze would be positively related to specific task-related communication functions (data gathering and patient education and counseling), but inversely related to socio-emotional communication functions (building a relationship and partnership). It was also hypothesized that the extent of computer use would be inversely related to verbal and non-verbal indicators of patient-centeredness.

2. Methods

This is an observational study of 3 primary care physicians, and a convenience sample of 30 of their patients, drawn at random from a larger study of medical education. The original investigators videotape-recorded the consecutive consultations of 8 family physicians and 233 of their patients in 6 academic family medicine clinics in northern Israel. An EMR system had been in use in the study clinics for over 5 years.

2.1. Procedures

Physicians were recruited to the study by members the original research team. A note on the physician’s door informed patients of the videotape study and invited them to participate. The physician also informed the patient that he or she was part of a study and that patients were free to participate, or not, as they liked. It was explained that the video cameras were set to capture the physician’s image only, but would record the patient’s voice. No patient inclusion/exclusion criteria were used. Of 235 patients approached for the study, 233 gave consent. Approval for the original study was obtained from the Technion School of Medicine in Haifa, Israel.

2.2. Sample

Three physicians (two females and one male) from three different clinics were randomly chosen for the current analysis. Two of the physicians had been in practice for over 10 years, and one was a fourth year resident. Physicians’ ages ranged from 34 to 44 years of age with between 5 and 14 years of experience beyond medical school.

Ten consecutive patients were chosen for analysis for each of the three physicians. Approval for the current analysis was obtained from Committee for Human Subjects, The Johns Hopkins Bloomberg School of Public Health, Baltimore, USA.

2.3. Development of the RIAS-Hebrew version

The RIAS has been used widely in Europe and North American, and increasingly in Japan. The numerous translations for international applications have demonstrated cultural adaptability and high levels of reliability and validity [25]. For the current project, a Hebrew translation of the coding manual was developed by the study’s first author (RSM), who is bilingual in English and Hebrew. The translated coding manual was critically reviewed for cultural appropriateness and clarity by co-author (SR), an Israeli primary care physician and medical educator, and several members of his Israeli research team. Each coding category in the manual was discussed and when appropriate idiomatic language and culturally relevant examples were added.

All study videotapes were coded by the first author (RSM). Facility in use of the RIAS was demonstrated by acceptable levels of coding accuracy (reliability coefficients [Pearson r] averaging .9 and .8, for physician and patient categories, respectively) in an unrelated sample of five US medical visits that were double coded by an experienced RIAS coder (MAD) and RSM. In addition, RSM double-coded five of the Hebrew study tapes, determined intra-coder reliability. Pearson correlation coefficients (r), representing a measure of intra-coder reliability for the RIAS categories reflected in this paper averaged .9, for both physician and patient categories.
2.4. Study measures

As described in detail elsewhere, the RIAS is a standardized system for analysis of medical communication that codes communication into mutually exclusive and exhaustive categories [25]. These categories can be organized in broad groupings to reflect the main functions of the medical interview: (1) gathering data, (2) patient education and counseling, (3) building a relationship, and (4) activating and partnering [24]. In this analysis, data gathering and patient education and counseling codes were reported in detail because of their link to specific hypotheses; however, the remaining codes were summarized into groupings, as reflected in Table 1, because of low frequencies.

In addition to the presentation of individual codes and groupings of codes described above, a calculation of a single summarizing patient-centered score was undertaken. Various RIAS-based patient-centeredness formulas have been reported in the literature [18,10,27,34,9] and while there are some differences in individual codes included in the numerator or denominator of a given calculation, the general approach is similar. For instance, Mead and Bower demonstrated the use of two somewhat different formulas in a single study with only minor variation in outcome [18]. A detailed discussion of patient-centered measures and their conceptual underpinning can be found in Roter and Hall [26]. Briefly, physicians' communication behaviors that encourage patients to talk, for instance, open-ended

<table>
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<td>Transition statements, instructions</td>
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<td>.05</td>
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<td>Patient-centeredness summary score</td>
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<td>.06</td>
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<td>All physician dialogue</td>
<td>4.22</td>
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questions and facilitators, empathic statements, and statements that relate to the psychosocial dimensions of care are common to most patient-centered assessment approaches. Communication that tends to restrict, control, or direct patients in some manner, like closed-ended questions and instructions, are generally seen as physician-centered. While most investigators would agree that the patient’s provision of psychosocial information to the physician is consistent with conceptions of patient-centeredness and the communication of the patient narrative, it can be argued that patients’ biomedical disclosure, particularly in response to a series of physician directed, closed-ended questions, reflects physician dominance in the exchange.

In the current study, the patient-centeredness score was calculated in a similar manner as Mead and Bower [18] and included the sum (all patient and physician psychosocial categories + all patient and physician emotional talk categories + patient questions + physician counseling) divided by the sum (physician closed-questions + physician orientations + patient biomedical information).

2.5. Extent of computer use

The extent of computer use was assessed in two ways:

1. Levels of active keyboarding: Three levels of active keyboarding were noted—sporadic typing (light), periodic typing (moderate), and continuous typing throughout the dialogue (heavy).
2. Computer screen gaze (time in seconds): The time the physician positioned him/herself towards the computer and gazed at the screen.

2.6. Analysis

When communication variables were related to the categorical measure of active keyboarding, one-way ANOVA was used to compare means across multiple levels. When variables were related to the measure of time in screen gaze, Pearson correlations were used. Because screen gaze was significantly correlated with length of visit, these results were presented as partial correlations, controlling for visit length.

3. Results

3.1. Overview

The length of the consultation ranged from 2.4 to 22 min with an average of 11 min. Physicians typically faced the desktop computer and patients did not have a view of the screen. Twenty-four of the 30 study visits were with adult patients and 6 were pediatric visits. A total of 20 female and 10 male patients’ visits were analyzed. The primary diagnoses varied widely and included acute conditions (i.e., upper respiratory infections, pain symptoms [back, chest, knee, and abdominal pain], ear infection, laryngitis, and urinary tract infections), disease management and follow-up (hypertension and diabetes, depression, cancer follow-up), and well-child visits.

The EMR was used for ordering and reviewing laboratory tests and results in 40% of visits, writing prescriptions in 70% of visits, and writing referrals in 50% of visits. EMR was not used for patient education or retrieval of information from the medical literature.

3.2. Levels of computer use

Computer use was evenly distributed over the three coded levels; light typing was evident in 38% of the visits, moderate typing in 38%, and heavy typing in 24% of visits. Physicians averaged 2.5 min (ranging from 25 s to 6.8 min) gazing at the computer screen, representing some 23% (ranging from 3 to 42.5%) of the total visit time. Levels of active keyboarding and computer screen gaze were moderately correlated ($r = .49$, $p = .006$).

Both time in screen gaze and keyboarding were positively correlated with length of the visit; the relationship was statistically significant for screen gaze ($r = .51$, $p = .00$) and suggestive for keyboarding ($F(2,27) = 2.83$, $p = .08$).

3.3. Impact of EMR use on communication dynamics

The associations between computer use and physician communication are summarized in Table 1. The table (top and middle) shows a significant relationship between computer use and physician performance of data gathering and patient education and counseling functions. Keyboarding was positively related to the number of closed-ended therapeutic regimen questions asked and both biomedical information giving and medical and therapeutic regimen counseling. Patient disclosure of biomedical information to the physician was also positively related to levels of physician keyboarding ($F(2,27) = 3.40$, $p < .05$; data not presented in the table). Perhaps related to higher levels of biomedical exchange, positive and negative categories of verbal engagement (agreements and disagreements) increased with keyboarding (Table 1, middle). Orienting statements (transition statements, instructions, and directions) were inversely related to screen gaze ($r = -.37$, $p = .04$) and decreased significantly ($F(2,27) = 3.43$, $p < .05$) when active keyboarding was heavy (level 3) (Table 1, bottom).

In the socio-emotional and psychosocial realm, screen gaze was inversely related to physicians’ use of psychosocial questions; emotional exchange (empathy, concern, reassurance) appears lessened with screen gaze, although this relationship does not reach statistical significance (Table 1, towards bottom).

Finally, despite the positive correlation between the extent of active keyboarding and visit length, keyboarding
was inversely related to the number of statements contributed by the physician \((F(2,27) = 4.22, p = .02)\) or the patient \((F(2,27) = 3.85, p < .05)\) to the visit dialogue.

3.4. Patient-centeredness and computer use

The patient-centered summary score suggested an inverse relationship to both active keyboarding \((F(2,27) = 3.19, p = .06)\) and screen gaze \((r = -.33, p = .08)\).

4. Discussion

In some respects, the computer has become a third party in medical visits, one that demands a significant portion of visit time. On average, physicians spent close to one-quarter of the visit gazing at the computer screen, and in some cases it was as much as 42% of visit time. These findings add specific numbers to the observation by Greatbatch et al. who reported that physician's visual attention was 'largely' directed to the monitor [13], as well as the work of Theadom et al. who noted diminished levels of non-verbal immediacy, including eye contact, among extensive EMR users [31]. Moreover, time gazing at the computer monitor was inversely related to physician engagement in psychosocial questioning and emotional responsiveness during the visit. Others have also found that poor eye contact inhibits patient disclosure of psychosocial concerns and physician awareness of patients' psychosocial problems [18,5].

Inasmuch as a physician cannot make eye contact with a patient when gazing at the computer monitor, it is not surprising that duration of screen gaze was inversely associated with the physicians' patient-centeredness summary score. Mead and Bower had also reported an inverse relationship between a RIAS-based patient-centeredness summary score and physician eye contact [18]. As others have suggested, avoidance of eye contact is often interpreted by patients as a sign of disinterest or unwillingness to engage in interaction [28,8]. It would seem that patients regard physicians' engrossment in the tasks of computing in a similar way, as disinterested or disengaged, with the same consequence for limited socio-emotional and psychosocial exchange.

The increase in visit length associated with EMR use apparent in this study can be attributed, at least in part, to the time physicians spent gazing at the computer monitor and keyboarding. It is evident that the extra visit time was not spent talking; keyboarding activity was inversely related to both physician and patient contribution to the medical dialogue. This finding is consistent with Greatbatch et al. [13], Warshawsky et al. [33], and Booth et al. [7] all of whom have noted that EMR visits are characterized by periods of silence, minimal, or distracted verbal engagement, and a reduction in overall interaction. In this regard, Patel et al. observed that less experienced EMR users were not nearly as facile as others in coordinating the substantive focus of their keyboarding with patient dialogue [22]. The cognitive tension resulting from doing one thing but talking about another may account for the overall reduction in dialogue and the impression of pre-occupation described above.

While EMR use, especially keyboarding, is associated with diminished levels of medical dialogue overall, and particularly psychosocial and socio-emotional exchange, it is also clear that it is related to increased data gathering and patient education and counseling in the biomedical domain. Similar findings have been reported by Makoul et al. [16] and Theadom et al. [31] with the suggestion that EMR use encourages evidence-based practice by seeking information and recording data in a more organized and comprehensive manner during the consultation. Unfortunately, the potential to enhance patient education even more through shared observation of data with patients, as suggested by Greatbatch et al. [13], was not evident. There were no instances in which study physicians engaged the patient in a review of test results, blood pressure readings, weight fluctuation, or HbA1c values. Similarly, there were no instances in which a physician used his or her computer to retrieve medical information to enhance patient understanding of a disease or a specific treatment.

In order to conduct this study, the investigators developed a Hebrew translation of the RIAS and applied it to a routine sample of Israeli primary care visits. RIAS categories were readily translated and demonstrated cultural relevance and suitability for the task. Moreover, the current analysis demonstrates substantial concurrent and predictive validity in replicating associations found among communication variables in other EMR and RIAS-based studies.

4.1. Study limitations

There are several limitations that diminish the generalizability of the study findings. First, this is a correlational study and as such the causal pathway is unclear; it is as likely that physicians’ interaction style drives his or her pattern of EMR use as it is that EMR use shapes physician style. We have tried to be careful in our presentation to avoid the suggestion of causality, although we may have not always been successful in doing so. Second, a small number of physicians and patients were studied and while they were chosen at random, they may not be representative of the larger population. Third, while a number of significant relationships were detected between the extent of EMR use and communication dynamics, other relationships may have been missed because the small sample provided inadequate statistical power to fully investigate all study questions.

Finally, RIAS-Hebrew coding of the study tapes was completed by a sole coder, who was also the study principle investigator, raising the possibility of inadvertent bias. Since no other Hebrew-speaking coder was available, it was not possible to compute inter-coder reliability. Nevertheless, intra-coder reliability was good and the similarity in the pattern of findings to other RIAS-based studies suggests strong predictive and concurrent validity.
5. Conclusions

This study suggests that the way in which physicians use computers in the examination room can negatively affect patient-centered practice by diminishing dialogue, particularly in the psychosocial and emotional realm. Screen gaze appears particularly disruptive to psychosocial inquiry and emotional responsiveness, suggesting that visual attentiveness to the monitor rather than eye contact with the patient may inhibit sensitive or full patient disclosure. Keyboarding diminished dialogue overall, but was positively associated with more data gathering and patient education and counseling of biomedical topics by the physician and patient disclosure of biomedical information to the physician. Nevertheless, the benefits of EMR use even in the biomedical realm were not fully realized in that physicians virtually never shared the screen with patients to review laboratory or test results, monitor patient progress in disease management, or provide the patient with print materials to enhance understanding of a disease or a specific treatment.

Given its commonplace standing in Israeli medicine, the negative associations between EMR use and patient-centered communication style and restricted psychosocial and socio-emotional exchange are especially disturbing. Unlike earlier studies in which the EMR had been newly introduced to a system or a user, these results cannot be interpreted as reflecting a transitional period of adjustment by patients and physicians, but rather the institutionalization of an intruding third party in the medical dialogue. As American policy makers have called for expanded use of automated medical records, we caution that implementation should be accompanied by training programs that can help ameliorate the unfortunate effects that EMR may have on patient-centered medical care.

5.1. Practice implications

As also suggested by Booth et al. [7], we believe that training to help physicians optimize interpersonal and educationally effective use of the EMR can make the difference between degradation or enhancement of the medical dialogue. This training can assist physicians in overcoming the interpersonal distancing, both verbally and non-verbally, with which computer use is associated. Simply reconfiguring the physical juxtaposition of computer desk and patient chair can help a good deal in this regard and raising consciousness regarding EMR effects on the medical dialogue can contribute to creative solutions. Furthermore, maximizing the potential for “collaborative reading” [13] of the EMR can contribute to improved quality of care, enhance the decision-making process, and empower patients to participate in their own care.

While further research is needed to fully understand the complexity that EMR use adds to the consultation, our findings support and expand previous research and can serve as a basis for larger studies in environments introducing EMR into outpatient care settings.

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References


