Research Paper ■

The Use of Electronic Medical Records:

Communication Patterns in Outpatient Encounters

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Abstract **Objective:** To assess physician–patient communication patterns associated with use of an electronic medical record (EMR) system in an outpatient setting and provide an empirical foundation for larger studies.

Design: An exploratory, observational study involving analysis of videotaped physician–patient encounters, questionnaires, and medical-record reviews.

Setting: General internal medicine practice at an academic medical center.

Participants: Three physicians who used an EMR system (EMR physicians) and three who used solely a paper record (control physicians). A total of 204 patient visits were included in the analysis (mean, 34 for each physician).

Main Outcome Measures: Content analysis of whether physicians accomplished communication tasks during encounters; qualitative analysis of how EMR physicians used the EMR and how control physicians used the paper chart.

Results: Compared with the control physicians, EMR physicians adopted a more active role in clarifying information, encouraging questions, and ensuring completeness at the end of a visit. A trend suggested that EMR physicians might be less active than control physicians in three somewhat more patient-centered areas (outlining the patient's agenda, exploring psychosocial/emotional issues, discussing how health problems affect a patient's life). Physicians in both groups tended to direct their attention to the patient record during the initial portion of the encounter. The relatively fixed position of the computer limited the extent to which EMR physicians could physically orient themselves toward the patient. Although there was no statistically significant difference between the EMR and control physicians in terms of mean time across all visits, a difference did emerge for initial visits: Initial visits with EMR physicians took an average of 37.5 percent longer than those with control physicians.

Summary: An EMR system may enhance the ability of physicians to complete information-intensive tasks but can make it more difficult to focus attention on other aspects of patient communication. Further study involving a controlled, pre-/post-intervention design is justified.

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Advances in electronic medical record (EMR) technology have made it possible for the EMR to replace many functions of the traditional paper chart, and use of EMR systems promises significant advances in patient care.[1] While the promise is compelling, it is also important to consider unanticipated effects that may be associated with EMR use. For instance, any additional point of focus for the doctor or patient—even a paper chart—can be distracting.[2] It is also possible that patients find medical encounters involving a computer less personal or fear that their confiden-

tiality could more easily be broached when the record is entered in a computer database.[3] Similarly, physicians may worry about the need to attend to the computer rather than the patient or may find the challenge of adapting to the new technology daunting.[4] Despite these concerns, empirical studies that have focused mainly on perceptions of the medical encounter have shown little or no adverse effect on either patient or physician satisfaction.[5–10] In fact, some patients report that having their physicians use an EMR enhanced satisfaction with the clinical encounter.[11]

The relationship between EMR systems and actual physician behavior in the examination room has received less attention. A 1995 review of extant literature showed evidence of positive effects on clinician behavior, mainly by reminders of recommended screening procedures and in increased efficiency and accuracy in prescribing medications.[12] Some evidence also suggested that the duration of consultations was lengthened and that patient-initiated discourse decreased in relation to physician-initiated discussion. Prior investigations have not, however, focused on fundamental communication behaviors.

In evaluating physician–patient interactions, we find it helpful to determine whether specific communication tasks (e.g., checking or clarifying information) are accomplished during a particular encounter, since patients' and physicians' perceptions of communication often differ from actual behavior.[13] Attention to communication tasks is likely to highlight whether and how physician–patient interaction is affected by use of an EMR. In this study, therefore, we employ the task approach to begin studying the communication behaviors of physicians who use an EMR system ("EMR physicians"), compared with those who use solely a paper record ("control physicians"). Consistent with this focus on behavior, we also analyze qualitative aspects of the physician–patient encounters to examine how EMR and control physicians used the computer and the paper records during their respective encounters. Two research questions provide the basic framework for this report:

1. *Do physicians who use an EMR system exhibit different communication patterns than those who use a paper record?* We are particularly interested in tracking tasks concerned with completeness of the record on an information-intensive level (e.g., clarifying information) and a broader, patient-centered level (e.g., exploring psychosocial issues).[14] In approaching this question, we hypothesize that physicians using the EMR will more often accomplish communication tasks that ensure completeness on an information-intensive level. This is based on our expectation that EMR physicians will have faster and more comprehensive access to information as well as a more structured template for reporting and retrieval.
2. *Do encounters with EMR physicians differ from those with control physicians in terms of visit length or number of laboratory tests ordered?* These are two important practical outcomes that may well reflect differences in the degree to which electronic records and paper charts facilitate or hinder the recording, organization, retrieval, and legibility of data.

Methods

This study was conducted at the general internal medicine faculty practice of an urban, academic medical center in Chicago. The EMR physicians had been using EpicCare (Epic Systems Corp., Madison, Wisconsin), a commercial EMR system, for 18 months prior to the start of this study. The EMR system enables physicians to record patient histories, display test results, write prescriptions, enter orders, receive clinical reminders, use decision-support tools, and print patient instructions and educational materials.

Subject Recruitment

We recruited a sample of three physicians who have been using an EMR in the examination room since the system was first implemented and three control physicians who use paper charts instead of the EMR system. The three EMR physicians were all male. Although 2 of the 15 EMR physicians at the practice site were female, they used the EMR primarily outside the examination room (i.e., after the consultation). Since we were focusing on behavior during use of the EMR in the examination room, neither of the female physicians was included in the study. To eliminate gender as a possible confounding variable, we recruited three male physicians for the control group.

Physicians were told that the study focused on physician–patient communication. Our goal was to collect data from 35 patient encounters for each of the six study physicians, which would afford a statistical power coefficient of 0.80 to detect small to medium effect sizes at $P = 0.05$, whether we were comparing EMR and control groups via two-tailed t-tests ($\beta = 0.80$ at $d = 0.40$) or individual physicians via ANOVA ($\beta = 0.80$ at $f = 0.25$, $u = 5$).[15] We approached patients once they had been directed to an examina-

tion room. Participating patients read and signed a consent form approved by the Institutional Review Board, describing the investigation as a "study of communication between doctors and patients" and outlining the ways in which data about their medical encounter would be collected.

Instruments

Questionnaire

As part of a larger research program, a five-page Consultation and Patient Appraisal (CAPA)[13] was distributed to the 31 general internists working at the practice in which this focused study was conducted, 13 of whom used the EMR system. An initial analysis of responses allowed us to target recruitment of the six study physicians toward those who reported similar attitudes regarding the CAPA's inventory of communication tasks and patient characteristics. Since focusing on specific attitudes and perceptions is beyond the scope of this article, only demographic information collected in the CAPA is reported here.

Medical Record Review

The medical record of each participating patient was reviewed after their consultation to capture age and gender information and to note utilization and continuity-of-care history, particularly the number of visits to the practice, number of visits to the physician seen during the study, and number of previous visits during which an EMR was used.

Video Analyses

Visits with patients of the study physicians were videotaped with small closed-circuit cameras, which allowed us to assess the actual form and content of interaction through use of the SEGUE Framework, a 25-item checklist that employs a nominal response scale (i.e., yes/no) to record whether physicians accomplish critical communication tasks during patient visits.[16] The SEGUE acronym stands for general areas into which the tasks are grouped—Set the stage, Elicit information, Give information, Understand the patient's perspective, End the encounter.

We focused on six of the SEGUE tasks in evaluating the completeness of information elicited by study physicians—namely, their attempts to outline the patient's agenda, explore psychosocial and emotional issues, discuss how the health problem affects the patient's life, check and clarify information, encourage the patient to ask questions, and ensure completeness of the encounter at its end (e.g., by asking "Is there anything else?"). We also recorded visit length and the number of laboratory tests ordered, two variables that could be affected by the type of record system used.

After reaching a high level of competence (i.e., K_n of at least 0.90 for all items)[17] and confidence, a research assistant coded all videotapes in the sample. In addition, we employed two strategies to gather qualitative information about utilization of the EMR system—1) a research assistant took detailed notes about how the computer was used (e.g., entering data, displaying data to the patient) during each videotaped medical encounter, and 2) the investigators (G.M. and R.H.C.) carefully reviewed videotapes of three randomly selected encounters for each study physician to examine how physicians used the computer or the paper chart during patient visits. The focus here was on positioning, attention to the record, and attention to the patient.

Sample

Between June 1997 and February 1998, we collected data from 238 clinical encounters with the six study physicians. In 18 cases, we lacked demographic information about the patients, and in another 16 cases, the videotape was inadequate, yielding complete data for a total of 204 patient visits (or a mean of 34 encounters per physician).

Patients

This study was conducted in a primary care environment, which is characterized by a wide range of patients and health problems. Approximately half (49.5 percent) of the 204 patients were female. Patients' ages ranged from 23 to 91 years, with a mean of 46.6 years (SD, 16.9) and median of 42 years. On average, these patients had been with the practice for 4.0 years (SD, 4.9); the median was 2 years. Within the two years leading up to their current visit, patients made an average of 5.4 visits to the practice (SD, 5.5), with a median of 4 visits. The patients did not always see the same physician, visiting the study physician an average of 3.5 times in the two years prior to the consultation (SD, 4.1); the median number of visits was 2.

Although 15.7 percent of patients in the control group had at least one previous encounter with an EMR physician in the practice, a printout of their electronic record was included in the paper chart as a matter of course (so that control physicians never needed the computer). In contrast, if a patient in the EMR group had at least one previous visit before the EMR was

implemented at the practice, the EMR physician worked with the paper chart as well as the computer.

Physicians

Ages of the EMR physicians ranged from 30 to 44 years; the youngest had been in practice 2 years, whereas the other two had been practicing for 12 years. The control physicians were between 33 and 40 years old; two of them had been practicing medicine for 4 years and the other had been in practice for 10. They all reported scheduling appointments with new patients at 40 minutes intervals and booking return visits at 20-minute intervals. Physicians in the study sample were representative of the predominantly male group at this practice site, who ranged in age from 29 to 49 years and reported the same appointment intervals.

Results

Communication Tasks

Table 1, which summarizes the extent to which the six study physicians accomplished key communication tasks, indicates that the EMR physicians checked and clarified information ($\chi^2 = 6.73$, $df = 1$, $P < 0.01$), encouraged patients to ask questions ($\chi^2 = 10.26$, $df = 1$, $P < 0.005$) and ensured completeness of the encounter ($\chi^2 = 14.97$, $df = 1$, $P < 0.005$) in a greater proportion of the videotaped patient visits than did the control physicians. There was a trend in the opposite direction for the three somewhat more patient-centered tasks (i.e., the EMR physicians accomplished them less than did the control physicians), although none of the differences were statistically significant. One-way ANOVAs were run to detect differences between physicians; there were no outliers within groups to account for the observed differences between groups.

Visit Length and Laboratory Tests

Overall, there were no statistically significant differences between the EMR and control visits in terms of mean time (26.7 min vs. 23.6 min, respectively) or the number of laboratory tests ordered (0.57 vs. 0.59). One difference emerged for initial visits only: The small sample of initial visits with EMR physicians took an average of 37.5 percent longer than did initial visits with control physicians. More specifically, EMR physicians spent a mean time of 35.2 min (SD, 16.8 min) with their 14 new patients, whereas control physicians spent an average of 25.6 min (SD, 12.5 min) with the 39 new patients in their group ($t = 2.24$, $df = 51$, $P < 0.05$).

Table 1 ■

Percentage of Visits in Which Study Physicians Accomplished Communication Tasks

Task	EMR (%) ($n = 102$)	Control (%) ($n = 102$)	*P* Value
Outline the patient's agenda	15.8	25.0	0.107
Explore psychosocial/ emotional issues	53.9	65.7	0.087
Discuss how health problem affects the patient's life	42.2	52.0	0.161
Check/clarify information	99.0	91.2	0.009
Encourage the patient to ask questions	24.5	7.9	0.001
Ensure completeness at end of visit (e.g., ask "anything else")	36.3	12.9	0.000

NOTE: Data were taken from the video analysis (see text).

Qualitative Analysis of Videotaped Encounters

As part of the video review process, we noted how EMR physicians integrated the computer system into each encounter. We observed the three EMR physicians using the computer to enter new information, retrieve patient data or test results, show patients graphic displays of clinical data over time (e.g., weight, blood pressure, laboratory values), write prescriptions, enter orders, and write patient letters as well as print encounter summaries and educational materials for patients. We also reviewed the videotapes of three randomly selected encounters for each study physician to develop a sense of how they integrated the EMR or paper chart into their patient-care activities. The following sketches summarize these observations.

EMR Physicians

In eight of the nine EMR encounters reviewed, the physician began by logging into the computer and calling up the patient's record, simultaneously talking with the patient. For patients whose visits predated the introduction of the EMR system, the physicians also had to contend with paper charts, often turning to the computer or paper chart while the patient was talking. The physicians' need to direct attention to the EMR appeared to be related to their typing skills, although regardless of typing ability, there were often long periods of verbal silence while the physicians entered data. The relatively fixed position of the computer on the desktop limited the ability of the physician to face the patient directly. Physicians sometimes shifted their body, and often their chair, to orient themselves toward patients when they were not entering or retrieving data.

Control Physicians

Two of the three physicians in the control group tended to focus eye gaze and physical attention on the paper record immediately after greeting the patient and asking the first question (e.g., "What seems to be the problem?"), while the third more obviously directed attention toward his patients. Although note-taking was well integrated in these encounters, reading or trying to find information in the paper chart entailed a considerable amount of time flipping through the pages. Physicians were often silent as they recorded or checked information in the chart. Physicians either held the chart in their laps or positioned the chart at the corner of the desk to orient their bodies and chairs toward their patients.

Discussion

This exploratory, observational study focused on a small number of general internists (i.e., three who use an EMR and three who do not). Our power analysis and statistical analyses assume that the unit of observation is the encounter, comparing EMR encounters to those involving only paper charts rather than comparing individual physicians. In other words, this was not a controlled study of the computer as an intervention. Thus, rather than arguing for broad generalization about the influence of an EMR on physician–patient communication, we will highlight hypotheses for further study as well as strategies for more effective use of this powerful technology in outpatient encounters.

Compared with the control group, the EMR physicians we videotaped adopted a more active role in clarifying information. This may be because of a semi-structured format for recording data, increased accessibility of information, or the availability of tools that help physicians share information with their patients. The EMR physicians also tended to solicit patient involvement to a significantly greater degree by encouraging the patient to ask questions and ensuring completeness of the encounter at its end. Although such behaviors might be associated with the more complete progress notes noted in an earlier study,[18] the proportion of EMR physicians accomplishing these tasks was fairly low (24.5 percent and 36.3 percent, respectively), a reminder of the continued need for attention to these tasks.[14] The observed trend suggesting that EMR physicians accomplished more patient-centered tasks to a lesser extent than did control physicians, coupled with the finding that initial visits with EMR physicians appear to have required extra time, underscores the need for a controlled, pre-/post-intervention study to better gauge the multifaceted effects of the EMR on physician–patient encounters.

Despite indications that the computer might prove advantageous, it was clear that EMR physicians in this study could not physically orient themselves toward their patients as easily as did physicians who worked with paper records. Other authors have noted that the orientation of computer hardware in the examination room is important.[5,19] The physician should be able to view the patient and the computer screen without having to change positions. An ability to maintain eye contact with the patient is crucial, as gaze serves to both gather information and convey attention.[20,21] Indeed, recent research has documented that indirect or broken eye contact and indirect facial orientation are associated with less patient disclosure.[22] Positioning the computer so that patients can see the screen may be helpful as well. Using portable computers or specifically designing offices to accommodate EMR systems may facilitate comfortable positioning of the physician, patient, and computer in ways that enhance patient-centered communication behaviors.

Like the importance of positioning and eye contact, the significance of the first few minutes of the encounter has been well documented. Patients should be given ample opportunity to present a narrative explanation of reasons for the visit during this time, and even the most apparently innocuous of physician behaviors (e.g., questions) can be interruptive.[23,24] Five of the six physicians we studied routinely spent the first minute or so in the examination room retrieving and reviewing patient information from the record, whether electronic or paper, dividing their attention during the crucial initial phase of the encounter. Although physicians in both groups tended to focus on the record early in the encounter, the sound of typing may have been more distracting than writing on paper. We are currently conducting a detailed analysis of verbal and nonverbal behavior during patients' initial narratives in this study sample to characterize and compare interruptions associated with the EMR and the paper chart systems.

Whether a physician uses an EMR or a paper chart, there is an inevitable conflict between physician–patient communication and information retrieval or recording. Cognitive psychologists have described a "bottleneck effect," a limit to the number of intellectually demanding tasks a person can perform simultaneously. When as few as two tasks are performed in parallel, most people focus on one at a time.[25]

Typing a note may demand more cognitive attention than writing one. We observed that the ability of an EMR physician to focus on communicating with patients while simultaneously recording information seemed directly correlated with their level of typing skill. Learning ways to minimize the problem of divided attention will increase the ability of physicians to use an EMR effectively.

This study presents a focused report about communication patterns associated with using either an electronic or paper-based medical record in a sample of outpatient encounters. Although some of the communication behaviors of the EMR physicians may be a function of EMR use, others probably reflect styles established before they began using the EMR. It would be worth studying whether coupling education on patient-centered communication[14] with EMR training would enhance the effective use of this tool. Further communication research that extends our findings and educational research that identifies productive training methods will be needed to understand how to optimize the potential benefit of EMR systems for both patients and providers.

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