Patients' Reactions to Physician Use of a Computerized Medical Record System During Clinical Encounters

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Background. As physicians begin to use computer technology in front of patients during clinical encounters, concern has been raised that such computer use may exert a dehumanizing effect on the physician-patient relationship. To investigate this concern, we measured patient reactions to physician use of a computerized medical record system during clinical encounters.

Methods. Adult patients who presented for clinical care were randomized into three groups. With the first group, the physician used a standard paper-and-pencil charting system during the encounter. With the second group, the physician used a computerized medical record system with keyboard input. With the third group, the physician used the computerized medical record system with voice input. Patient reactions were measured with a questionnaire that the patients completed after the clinical encounter.

Results. For most components of the physician-patient relationship studied in this report, questionnaire scores did not differ significantly among the three study groups. Patients in the voice input group rated physician explanations of patient problems significantly higher than patients in the other two groups. There was a trend for patient confidence in the physician to be higher in the keyboard input group. Although measured encounter durations were significantly shorter in the computer groups, there were no differences in patient satisfaction with encounter duration among the three groups.

Conclusions. Physician use of computers during clinical encounters was not associated with a decline in the perceived quality of the physician-patient relationship.

Key words. Medical record systems, computerized; physician-patient relations; patient satisfaction.
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As physicians begin to use computer technology in front of patients during clinical encounters, concern has been raised that such computer use may be detrimental to the physician-patient relationship, thereby worsening the quality of medical care.[1-3] Several studies have investigated the validity of this concern.[4] In general, a review of the literature revealed no consistent decrease in perceived quality of care, no increase in perceived physician impersonality, and no increase in patient stress as a consequence of the physician using a computer during a clinical encounter. However, none of these studies included computer systems that incorporate recently developed voice-input technology. Consequently, we designed a prospective, randomized study to compare patient reactions to physician use of a paper and pencil with computer techniques using keyboard input and voice input during clinical encounters.

Methods

The computer system employed in this study was MEDMOS*, created by the second author for use in his suburban Arkansas private family practice clinic. The program consists of a hypertext system that generates progress notes, prescriptions, and patient education ma-

*Now available as SOAPware, Medical Documentation, Inc, Van Buren, Ark, 1992.

Mean Scores* on Physician-Patient Relationship as Measured by Patient Questionnaire

Component of the Physician-Patient Relationship	Paper Group	Keyboard Group	Voice Group	MANOVA F Value	MANOVA P Value
Patient confidence in physician's treatment	6.6	7.3	6.8	2.46	.09
Physician explanation of patient's problems	6.4	6.7	7.4†	6.54	.003
Physician enthusiasm	6.5†	7.2	7.1	4.53	.02
Physician friendliness	6.8	7.2	7.1	1.54	.22
Physician attention to patient	7.0	7.0	6.9	0.02	.98
Ease of communication	6.9	7.2	7.2	1.53	.22
Patient sense of ease during the encounter	6.7	7.2	7.0	1.91	.16
Patient judgment of physician's office equipment	6.6	6.8	6.7	0.52	.60
Patient perception of physician knowledge	7.0	7.3	7.1	0.50	.61
Patient perception of privacy of medical record	6.0	6.2	6.4	0.41	.67
Patient satisfaction with encounter duration	6.6	6.8	6.7	0.42	.66
Overall patient satisfaction	6.5	6.9	7.1	1.81	.17
Actual encounter duration, min	12.1†	9.3	9.9	4.25	.02

*Range of scores = 2.0–8.0. Score of 2.0 indicates that the patient felt negative about that component; score of 8 indicates that the patient felt positive.
†P = .05.
MANOVA denotes multivariate analysis of variance.

terials. A voice input system is also provided. The system is networked so that it is available in all examination rooms for use during patient encounters.

Study subjects consisted of adult patients (18 years of age or older) who presented to the second author for clinical care. The subjects knew this physician from previous clinical contacts, but they had no prior exposure to the computerized medical record system. A computer-generated random sequence was used to assign patients to one of three groups. With the first group, the physician used standard paper-and-pencil documentation techniques during the encounter. The computer was visible in the room, but it was not used. With the second group, the physician used MEDMOS with a keyboard for input. With the third group, the physician used MEDMOS with a voice input system. Encounter duration was measured by recording the time when the physician entered and left the examination room.

We measured patient reactions to the clinical encounters with a questionnaire that was completed by study patients after seeing the physician. The questionnaire measured patient reactions to 12 components of the physician-patient relationship (Table). We chose these components because they had been studied in prior investigations of patient reactions to physician use of computers during clinical encounters.[5–9] The second author was blinded to the content and composition of the questionnaire until after completion of the data collection phase of this study.

We scored each component of the physician-patient relationship by including both a positive and a negative statement about that component in the questionnaire.

Questionnaire statements were randomly ordered. Patients responded to the questionnaire statements on a five-point Likert scale. Scores for the positive questionnaire statements ranged from 4 for "strongly agree" to 1 for "strongly disagree." Scores for the negative statements ranged from 1 for "strongly agree" to 4 for "strongly disagree." Summation of both statements for each component resulted in a final component score of 8 (patient felt positive about the component) to 2 (patient felt negative about the component).

In addition to the patient responses, the questionnaire recorded patient demographic data, and subjects were divided into groups by the following variables: sex; prior computer exposure (daily use vs less than daily use); educational level (completed high school vs less than a high school education; age (younger than 40 years vs 40 years or older).

We used chi-square techniques to search for demographic differences among the study groups. Fisher's exact test was used to search for differences between the patients who did not return their questionnaires and those who did (the study population). We employed multivariate analysis of variance (MANOVA) techniques to assess the significance of any differences encountered among the three study groups. Post hoc testing was accomplished using the Student-Newman-Keuls procedure. Student's t tests were used to investigate the significance of differences in overall patient satisfaction scores among the demographic groupings of patients in the computer groups. Statistical significance was set at an alpha level of .05.

Results

A total of 93 patients were randomized into the three study groups. No patients were surveyed twice. Seventy-one patients completed the questionnaire before leaving the physician's office. Twenty-two patients took the questionnaire with them to complete and return at a later time. Only 9 of these 22 questionnaires were returned, giving a total of 80 completed questionnaires (an 86% response rate). The final group of 80 patients included 29 patients in the paper-and-pencil group, 28 in the keyboard input group, and 23 in the voice input group. There were no significant differences in sex, age, educational level, or prior computer experience among the three study groups. Of the 13 patients who did not return their questionnaires, 6 were in the paper-and-pencil group, 4 in the keyboard input group, and 3 in the voice input group (Fisher's exact test, $P = .81$).

The mean questionnaire response scores for the three study groups are summarized in the Table. Although scores for most components of the physician-patient relationship did not differ among the three study groups, there were components for which statistically significant differences were noted. Physician enthusiasm was rated significantly higher in the computer groups than in the paper-and-pencil group. Patients in the voice input group rated physician explanations of patient problems significantly higher than patients in the other two groups. Although this did not quite reach statistical significance, there was a trend for patient confidence to be higher in the keyboard input group. Although measured encounter durations were significantly shorter in the computer groups than in the pencil-and-paper group, there were no differences in patient satisfaction with encounter duration among the three groups.

For those patients exposed to the computerized medical record system, there were no differences in overall patient satisfaction scores by patient sex, age, educational level, or prior computer use.

Discussion

Physician use of computers during clinical encounters was not associated with a decline in the quality of the physician-patient relationship. On the contrary, computer use was associated with statistically significant improvements in several components of the physician-patient relationship. Voice input was associated with greater patient satisfaction with the physician's explanation of the patient's medical problems. Keyboard input was associated with an increase in patient confidence in the treatment offered by the physician. Findings such as

these have been reported in prior work. In a survey of patient responses to physician use of computers in examination rooms, a majority of respondents felt that physicians would make better diagnoses if they used a computer during the encounter.[8]

Much of the concern with physician use of computers during clinical encounters has centered on the fear that the physician will spend more time looking at the computer than attending to the patient.[3,10] In this study, "physician attention to patient" scores were not significantly different among the study groups. These findings are in agreement with prior studies.[9,11] The second author noted that he is able to generate encounter notes much faster with the computerized system than he can by writing. Because less time is spent to generate notes, he feels that he now has more time to talk with patients during clinical encounters. Future studies will be necessary to assess whether these anecdotal impressions are valid. For now, however, the weight of the data suggests that computer use during clinical consultations does not significantly distract physician attention from the patient.

Patient demographic variables have often been studied to assess their effect on patient acceptance of physician use of computers during clinical encounters. Early studies found that younger patients were more accepting of computer use in the examination room than older patients.[6,8] On the other hand, and more in accordance with our results, a later study found that age had no bearing on patient acceptance.[11] Another variable, patient exposure to computers outside medical settings, has been found to be significantly associated with favorable responses to computer use in the examination room.[6,8,10] Moreover, two separate multiple regression analyses of respondent age, sex, and prior computer use found the last variable to be the most strongly predictive of favorable patient responses to physician use of computers during clinical encounters.[6,8] In contrast, our study found no differences between patients who used computers on a daily basis and those who had less exposure to computers. As computers become more pervasive in our society, persons in all demographic groups will become more comfortable with computer use, perhaps leading to a waning of the importance of these demographic variables.

Several limitations to this study should be mentioned. The major limitation involves the use of the second author as the sole physician conducting the study. As the developer of the computer system used in this report, the second author has a high degree of interest in the use of computers to aid physicians in the generation of medical records. Indeed, his enthusiasm was rated significantly higher by patients in the computer input groups than by patients in the paper-and-pencil group.

Prior studies have shown that differences among physicians affected the physician-patient relationship more than whether the physician used a computer during the clinical encounters.[12] Thus, our results may not be generalizable to other physicians who are not as interested in the use of computerized medical record systems.

Although significant differences were found for several components of the physician-patient relationship studied in this report, the absolute value of these differences is often small. These small differences potentially limit the real-world meaning of our findings. Several characteristics of study design could have decreased the absolute differences among the study groups by skewing patient ratings to positive responses. The prior relationship between physician and patient could have biased the patients to give him higher ratings. In addition, the timing of questionnaire collection could have had a major impact. In an effort to maximize the questionnaire return rate, patients were asked to complete the questionnaire before leaving the physician's office. Although it was emphasized that patient responses would not be viewed by office staff, the staff did collect the questionnaires personally from the patients, and that may have biased patient responses.

In this study, we found that physician use of a computerized medical record system was not associated with a decrease in the quality of the physician-patient relationship. Such results are reassuring, given the likely requirement of computerized medical records in the future of American medicine. The Institute of Medicine's report on computer-based medical records is the most recent and authoritative call for the automation of medical records in this country.[13] The Medical and Health Insurance Information Reform Act of 1992 is a piece of legislation currently under consideration that would require hospitals receiving federal funding to automate their medical record-keeping system by January 1996.[14] The bill requires that data be obtained at point-of-care locations; that is, during clinical consultations such as those studied in this report. As we pursue technical excellence, it will be important to monitor the effects on our patients of these technical improvements. It is incumbent upon us to ensure that our technical wizardry does not begin to impair that most ancient and fundamental healing power, the interpersonal relationship between physician and patient.

Acknowledgment

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