Assessing Physician Attitudes Regarding Use of an Outpatient EMR: A Longitudinal, Multi-Practice Study

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ABSTRACT

A pre- and post-implementation assessment of physician attitudes was undertaken as part of the evaluation of the pilot implementations of an outpatient EMR in 6 practices of a large academic health system. Our results show that these physicians are ready adopters of computer technology when it demonstrates value-added for the effort required to use it. These physicians utilize email, the Internet, remote access to computer systems, and personal productivity software because they serve a valuable purpose in their academic and clinical work and in their personal lives. Much more critical to the acceptance of an EMR by physicians is its ability to facilitate efficient clinical workflows without negative effects on the valued relationships physicians have with their patients – those that are based on rapport, quality of care, and privacy.

INTRODUCTION

Although implementations of electronic medical record (EMR) systems in outpatient settings are rapidly increasing, the move from the paper chart to a computerized record continues to challenge healthcare organizations. Several studies have examined the anticipated and actual impacts of outpatient EMRs on patient care. Results have shown that physicians are concerned about increased time required compared to previous methods [1,2] decreased rapport with patients [3,4], and "computer anxiety."[5]

There are few longitudinal studies of outpatient EMR implementations [5,6] and fewer still that utilize validated instruments. Our objectives in this study were to use validated instruments *1)* to assess the attitudes of physicians regarding implementation of an EMR in 6 outpatient clinics of an academic medical center, both prior to implementation and after 6 months of use; and *2)* to examine some of the factors influencing their attitudes toward the EMR implementation.

METHODS

A comprehensive, longitudinal, multimethod assessment of physician attitudes was undertaken as part of the evaluation of the pilot implementations of an outpatient EMR in 6 practices of a large academic health system: Physical Medicine and Rehabilitation, General Internal Medicine, Renal, Pulmonary, Geriatrics, and Infectious Disease. This ongoing evaluation effort seeks to develop validated, re-usable instruments and methods to evaluate the impacts of the EMR on these practices and to use this knowledge to improve the pilot implementations, as well as the subsequent EMR rollout to all 1700+ physicians in the health system.

The EMR implemented during this study was EpicCare, produced by Epic Systems Corporation of Madison, Wisconsin. Physicians performed all of the functions related to their outpatient practice using system workstations present in the examination rooms. Typically, order entry for both medications and diagnostic testing and specifications of level of service and follow-up are all handled directly by the physician with the patient present or very soon after the encounter ends. Documentation of past history and information specific to the encounter varied by provider, with some providers dictating their documentation and correspondence after the encounter, while others completed their documentation in front of the patient, and still others used the system to take brief notes that were completed after the encounter was concluded.

We have previously reported results of the first pilot clinic implementation, which utilized pre- and post-implementation surveys, interviews, and observations to assess physicians' and patients' attitudes regarding the EMR.[4] In this paper we describe the results of pre-implementation physician survey and the first of two post-implementation physician surveys, at 6 months and 18 months after deployment, in all six academic-based outpatient clinics in which the EMR was piloted. The surveys and methods used are described in the following sections. Every effort was taken to maintain subject anonymity in the surveys. Survey data were entered into a database using a

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double entry method to ensure accuracy. "Statistical analysis was performed using the SPSS statistical package. The independent variable was time (before and after implementation); given that that the pre- and post-implementation samples were not necessarily the same individuals, independent samples t-tests were used to test for differences.

Pre-implementation physician survey

A validated instrument developed by Cork, et al. (itself rooted in the work of Teach and Shortliffe) was used to assess physicians' general attitudes regarding applications of computers in medicine prior to the EMR implementation.[7,8] Survey items focused on physicians' demand for specific computer system features (the "feature demand" attribute) and the potentially beneficial or detrimental effects of computers on medicine and healthcare in general (the "computer optimism" attribute). Survey items also obtained demographics; patterns of computer use for specific tasks relevant to patient care, teaching, research, and communication; and computer training and knowledge. Additional items were developed for this study to assess physicians' attitudes regarding the potential effects of an EMR on their medical practice. These items were adapted from the general "computer optimism" items of Cork, et al. and the results of published studies on physicians' attitudes towards EMR use. The measurement properties of these 24 items have been assessed with both pre- and post-implementation samples to create a single-factor, 18-item scale (the "EMR optimism" attribute.) The scale explained 40.71% of the total variance in the post-implementation sample with reliability of .9183 (N = 60). The pre-implementation survey was distributed to 97 physicians (attendings, fellows, and residents) several months in advance of the EMR deployment in each practice.

Post-implementation physician survey

The post-implementation survey repeated sections from the pre-implementation survey for comparison. Two additional sections were developed to assess users' perceptions of the potential benefit derived from specific EMR functionality and their satisfaction with the system and its implementation. Factor analysis of the post-implementation survey with our sample supports two corresponding scales: the single-factor, 18-item "EMR functionality" scale and the single-factor, 10-item "EMR satisfaction" scale. A third new section elicited suggested system implementation improvements. A full description of the development of the pre- and post-implementation survey instruments and an assessment of their measurement properties is beyond the scope of this paper, but is in the process for peer review.

The survey was distributed to 124 physicians approximately 6 months after each had begun using EpicCare in his/her practice. Due to a staggered implementation schedule, the post-implementation surveys were conducted over an 18-month period.

RESULTS

Results are reported for 75 physicians who completed the pre-implementation survey and 95 physicians who completed the post-implementation survey. See Table 1 for response rates for each survey, composition of sample by specialty, as well as age, gender, and position descriptive statistics.

Table 1 – Response Rates and Demographics

PM&R: Physical Medicine and Rehabilitation; GIM: General Internal Medicine

	Pre-implementation	Post-implementation
Response Rate Overall	77.3%	76.6%
Practices	Percent of Sample	Percent of Sample
PM&R	22.7%	12.2%
GIM	21.3%	25.6%
Renal	21.3%	14.6%
Pulmonary	12.0%	23.2%
Geriatrics	18.7%	19.5%
Infectious Disease	4.0%	4.9%
Average Age	40.03	41.80
Gender	Percent of Sample	Percent of Sample
Male	70.3%	73.8%
Female	29.7%	26.3%
Position	Percent of Sample	Percent of Sample
Attending / Faculty	87.7%	70.0%
Fellow	10.5%	20.0%
Resident	1.8%	3.8%
Unreported	0%	6.2%

Pre-implementation physician survey

Prior to implementation of the EMR the respondents viewed themselves as neither sophisticated nor unsophisticated users of computers. They averaged 14.49 hours of computer use per week. The most frequently cited uses (1 = never use computer for task; 2 = sometimes; 3 = often; 4 = always) were writing (3.15), preparation of presentations (3.18), searching the medical literature (3.11), and communicating with colleagues (2.97). All respondents reported using email and 90% check it at least daily, most frequently to communicate with academic and clinical colleagues. Over 40% of respondents reported using email to communicate with patients. Nearly 95% of respondents use the Internet and 41% report they access it at least daily. 73% of respondents access a computer system remotely, but only 12.5% as frequently as daily. Most physicians (81%) reported accessing clinical data via the medical center's electronic patient data archive.

Physicians felt that the impact of computers on medicine and healthcare in general would be beneficial, average 3.32 (S.D. = .47) on a scale of 1 to 5 (1 = highly detrimental and 5 = highly beneficial). In particular, these respondents indicated they believed computers would have the most beneficial effect on the quality of healthcare (mean = 3.89), interactions within the healthcare team (mean = 3.81), and the cost of healthcare (mean = 3.58). They felt that computers would negatively impact personal and professional privacy, average 2.74 (S.D. = .77), the humaneness of the practice of medicine, 2.86 (S.D. = .63), and rapport between clinicians and patients, 2.87 (S.D. = .67).

Using the "EMR optimism" scale, these physicians believed that the overall effect of the EMR would be beneficial to their practices, average 3.65 (S.D. = 0..43) on a scale of 1 to 5 (1 = highly detrimental and 5 = highly beneficial). They indicated that their chief concerns about using an EMR were related to issues of patient privacy, physician-patient rapport, time to document and place orders, patients' satisfaction with quality of care received, overall quality of care delivered, and physician autonomy. Results are shown in Table 2.

Post-implementation physician survey

Six months after they had begun using the EMR, physicians averaged a significant (p = .003) increase of 5.86 hours per week of computer use. Two categories of frequency of hands-on computer use changed significantly (p = .001): the use of the computer to document patient information (+.54 to 2.92) and to assess clinical data (+.67 to 3.32), where 3 = often use computer for task. There were no significant changes in other categories and frequencies of computer use, except for an increase in the frequency with which physicians access a system remotely (+41.2% to 53.7%).

While they still perceived the overall effect of the EMR to be at least marginally beneficial, average 3.07 (S.D. = .52), their optimism was significantly (p = .000) decreased, average –0.59. Table 2 shows that physicians' chief concerns after implementation continued to be the impact of the EMR on the time required to enter orders and document encounters, on the rapport established between physician and patient during the visit, and on patient privacy. Decreases in these individual item mean responses 6 months after implementation were significant (minimum p = .006), as were the decreases in mean responses of all but four individual items. Other items that were rated to show that the EMR had a detrimental impact (below the 3.0 neutral point) included patients' satisfaction with quality of care received and physician autonomy.

Overall optimism regarding the impact of computers in medicine and healthcare, the "Computer Optimism" scale, did not significantly decrease over the 6-month period between surveys, average 3.18 (S.D. = .62). The only significant change in attitudes was that physicians felt computers in medicine would have an even more detrimental effect on personal and professional privacy than they had previously judged, a significant (p = .001) decrease of –0.44 to 2.30 (S.D. = .83).

The EMR satisfaction scale after 6 months of using the system indicated that overall satisfaction is below the neutral point, average 2.74 (S.D. = .68). Looking at selected specific satisfaction items: 30.3% of physicians felt that the system was worth the time and effort required to use it; 37.7% would return to old system, if given the choice; 36% don't think report and letter formats meet their needs; 59.5% did not think the system was easy to use; 65.8% do not thing the system is forgiving of user exploration and mistakes; and 23% believed they did not receive sufficient training.

Table 2. Ratings of "Effect of EMR in my practice on:" – Pre- and Post-Implementation Survey Results*

Physicians' Concerns	*Pre-implementation Survey*		*Post-implementation Survey*		Change Between Surveys		
	Mean	S.D.	Mean	S.D.	Mean	Std. Error	Sig. (2-tailed)
Time required to enter orders, such as for tests or medications	3.03	1.09	1.82	.91	-1.21	.17	.000
Time required for documentation, such as progress notes	2.89	.1.10	2.02	.98	-.81	.17	.000
The rapport established during the encounter between clinicians and patients	2.86	.57	2.28	.72	-.58	.11	.000
Patient privacy	2.74	.90	2.38	.71	-.37	.13	.006
Physician autonomy	3.13	.68	2.64	.86	-.48	.13	.000
Patients' satisfaction with the quality of care they receive	3.20	.60	2.91	.85	-.29	.12	.019
The overall quality of health care that you give your patients	3.49	.68	3.00	.84	-.49	.13	.000

*Responses ranged from one ("highly detrimental") to five ("highly beneficial").

DISCUSSION

At the 6-month post-implementation point, our results strongly demonstrate that physicians are disenchanted with the EMR. Overall optimism about the impact of the EMR on their practice is significantly decreased since implementation of the EMR, from slightly beneficial to neutral. The individual items that indicate a detrimental effect at six months are specifically related to the issues of physicians' time and control (time required to document and order, clinician autonomy) and patient-centered issues (rapport, privacy, and satisfaction). All other individual EMR optimism items exhibit significant decreases, yet remain in the beneficial to neutral range, including perceived benefit from improved access, organization, and quality of the record. Overall satisfaction with the EMR at 6 months is below the neutral point.

This study has also found these same physicians to be ready adopters of other computer technology in their professional and personal lives, including routine use of email with colleagues and patients, the Internet, and productivity software. Lacher reported similar results for a sample of 9,466 internists.[9] Also, the physicians in our study did not experience the same decline in overall optimism regarding the use of computers in medicine and healthcare, in general, as they experienced for the EMR. Only the issues of the humaneness of medicine and personal and professional privacy were decreased. This common thread of privacy concerns was corroborated in a previous study, in which we compared the concerns of physicians and patients regarding the use of EMRs during outpatient encounters, we found that privacy was a shared concern.[4]

Prior to implementation, most physicians' optimism about the EMR is without any basis in reality, unless they have used an EMR previously. Once they realize that considerable effort is associated with tasks that are seen as "accessory" to the actual provision of care, a "reality check" occurs and optimism declines. Other studies have shown that physicians often experience a period of adjustment following the introduction of an EMR, during which satisfaction with the system is depressed.[5,6] Our post-implementation interval of 6 months falls well within this expected break-in period, which may account for the level of dissatisfaction we report here. Therefore we are in the process of administering a second post-implementation survey to these physicians, timed at least 18 months after implementation for all pilot sites.

Future work includes a second administration of the post-implementation survey and conducting semi-structured interviews in existing practice sites. We

also continue to use this evaluation approach as new EMR sites are brought online.

CONCLUSIONS

This longitudinal study of physicians' computer usage patterns and attitudes regarding computer use in medicine in general, and their attitudes regarding the implementation of an EMR in their outpatient practices in particular, has shown physicians to be ready adopters of computer technology when it demonstrates value-added for the effort required to use it. These physicians utilize email, the Internet, remote access to computer systems, and personal productivity software because they serve a valuable purpose in their academic and clinical work and in their personal lives. This acceptance of technology is in direct opposition to the computer-phobic reputation that physicians have been awarded. These findings therefore devalue computer phobia as an explanation for the slow adoption of EMRs in clinical medicine. Much more critical to the acceptance of an EMR by physicians is its ability to facilitate efficient clinical workflows without negative effects (actual or perceived) on those valued relationships physicians have with their patients that are based on rapport, quality of care, and privacy.

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