
Computers in Emergency Medicine

PHYSICIAN AND NURSE SATISFACTION WITH AN ELECTRONIC MEDICAL RECORD SYSTEM

Antonios Likourezos, MA, MPH,* , † Donald B. Chalfin, MD, MS, ‡, § Daniel G. Murphy, MD, MBA,*
Barbara Sommer, RN, MA,* Kelly Darcy, RN, BSN,* and Steven J. Davidson, MD, MBA*, ||

*Department of Emergency Medicine, Maimonides Medical Center, Brooklyn, New York, †Mount Sinai School of Medicine, New York, New York, ‡Division of Critical Care Medicine, Montefiore Medical Center, Bronx, New York, §Albert Einstein College of Medicine of Yeshiva University, Bronx, New York, and ||State University of New York Downstate Medical Center, Brooklyn, New York
Reprint Address: Antonios Likourezos, MA, MPH, Division of Research, Department of Emergency Medicine, Maimonides Medical Center, 4802 Tenth Avenue, Brooklyn, NY 11219

Abstract—Electronic Medical Records (EMRs) are intended to support clinical activity, improve efficiency, and reduce error. Reluctance to use EMRs may exist among clinicians. The purpose of this study was to assess physician and nurse satisfaction with an Emergency Department (ED) EMR. We surveyed Emergency Medicine (EM) physicians and nurses at a large urban teaching hospital after implementation of an Emergency Department EMR. The questionnaire assessed: 1) computer background and experience; 2) perceptions regarding EMR use; and 3) concerns about impact upon quality of patient care. The clinicians find the EMR easy to use and are generally satisfied with the impact on their work. However, they report that the EMR has no positive impact on patient care. They report confusion in following the sequence of screens, and are concerned with the amount of time it takes to use the EMR and the confidentiality of patient information. Similar results were found between physicians and nurses. Nurses, but not physicians, report that they are able to finish work much faster than before implementation ($p < 0.05$). We were unable to correlate computer background and experience with satisfaction with an EMR. This survey suggests

that EM physicians and nurses favor the use of an EMR and suggests opportunities for EMR enhancement. © 2004 Elsevier Inc.

Keywords—survey; emergency medicine; physicians; nurses; electronic medical record

INTRODUCTION

Healthcare institutions are implementing electronic medical record (EMR) systems (1,2). EMRs are intended to support medical and nursing staff in their daily work by means of electronic data processing (1). The EMR has the potential to improve the quality and reduce the cost of health care (3). There are five axes along which the EMR system can be evaluated: system response time, time required by users to learn the system, ability of users to remember what they learned, error rate, and subjective user satisfaction (3). As reported by Sittig et al., regardless of the outcome of the other four factors, if users are not satisfied with the system they may be reluctant to use it (3).

Few studies to date have assessed physician and nurse satisfaction with an EMR (1–8). Additionally, only three studies have correlated physician computer background

Presented in part at the New York Regional Meeting of the Society for Academic Emergency Medicine, New York, NY, April 9, 2003, and at the World Congress of Disaster and Emergency Medicine, Melbourne, Australia, May 10, 2003.

Computers in Emergency Medicine is coordinated by James Killeen, MD, and Donna Kelly, RN, of the University of California San Diego Medical Center, San Diego, California

RECEIVED: 22 May 2003; FINAL SUBMISSION RECEIVED: 18 February 2004;
ACCEPTED: 30 March 2004

and experience with attitudes about EMR, and the results were contradictory (6–8). One study found that computer background and experience was not related to perceived satisfaction with the EMR, nor was it related to perceived difficulty of implementation, adequacy of training, or anticipated future use of an EMR system (6). The second study found that computer experience, computer anxiety, and perceptions of organizational support predicted the degree to which physicians and mid-level practitioners view the EMR positively (7). The third study compared EMR users with non-users, and found that a greater proportion of EMR users utilize the Internet at home or at work, use e-mail at work, and also use a personal digital assistant. Frequent EMR users also perceive a greater need for computerized medical records and express less concern about data entry, and have more confidence in EMR security and confidentiality and less concern about the cost for installation and ongoing use of EMRs, as compared to non-users (8).

This study was undertaken to measure clinicians' computer background and experience, satisfaction with, perception of, and concerns about an EMR in routine clinical use. The results will assist in determining the EMR's impact on workload and quality of care.

MATERIALS AND METHODS

This study was conducted in the Emergency Department (ED) of a large urban teaching hospital affiliated with a school of medicine. In August 2002, the ED administration implemented an EMR for use 24 h a day, 7 days a week to replace the existing paper and pen system. This particular ED EMR has the following functions: triage, patient and orders and results tracking, bar-coded patient identification bands and labels, on-line documentation, order entry and results reporting, charge capture, and document scanning.

The initial training of ED staff was done by the ED Super Users, comprised of physicians, nurses, patient care technicians and clerk-registrars. Subsequent training was performed by the hospital's Information Systems training team. The duration of each class was dependent on the functionality of each user and additional training sessions were held if the functionality of the user changed. EMR question and answer sessions were held regularly and users were informed of deficiencies of workflow processes and documentation. Some workflow processes were changed or adapted in response to staff or managerial concerns.

Three months after implementation, in November 2002, we surveyed the emergency physicians and nurses to assess their satisfaction with the system. We hypothesized a priori that: 1) most clinicians would be satisfied

with the EMR, 2) computer background and experience and amount of time using the EMR would positively correlate with EMR satisfaction, and 3) due to different clinical duties, we expected that there would be differences between physicians and nurses with respect to use, satisfaction, and perception of the EMR.

The study was approved by the hospital's institutional review board (IRB). Informed consent was waived by the IRB. Participation in this survey was anonymous and voluntary. All data were kept confidential and used only for research purposes. The electronic data were stored in a password-protected computer, and the printed questionnaires in a locked filing cabinet.

A survey packet was administered to each Emergency Medicine (EM) clinician. The survey packet included an introduction letter explaining the study and instructions for completing the questionnaire and returning it in a self-addressed stamped envelope. The survey packet was put in the office mailbox of each physician. The survey packet was given to each nurse along with his or her paycheck or personally given out by the nurse manager. They were given 1 month to return the survey. A few arrived 1 to 2 weeks after the deadline and were included in the analyses.

The questionnaire consisted of 57 items and was developed using items from questionnaires used in past studies (2,3,8,9). These questionnaire items had been tested in physicians and had been found to be highly reliable and to have high content and construct validity (2,3,8,9).

The questionnaire was divided into three sections: The first section included questions about the clinician's demographic characteristics. All date responses that were < 1 year were entered as 0.5 years. The second section included questions about clinician computer background and experience, not including the EMR. We coded yes as 1 and no as 0. The third section included questions about perceptions regarding EMR use and concerns about impact upon quality of patient care. The responses were provided in a Likert scale: strongly agree (SA), agree (A), disagree (D), and strongly disagree (SD) (10). In the data analyses we categorized SA and A into one group: A (code = 1); D and SD into another group: D (code = 0).

The questionnaire items were summarized by the use of descriptive statistics, using valid percentages for all categorical variables and using medians with lower and upper ranges for all continuous variables. To allow for comparisons between physicians and nurses, the following non-parametric tests were employed: the Mann-Whitney test for continuous variables and the chi-square test for categorical variables. The Fisher's exact test was utilized if there were 5 or less participants in one cell. A *p* value of less than 0.05 was considered significant. Data

Table 1. Demographic Characteristics and Computer Background and Experience

	All	Physicians	Nurses	<i>p</i> Value
% White	53.5	72.7	33.3	.010**
N	43	22	21	
% Female	58.1	27.3	90.5	.001†
N	43	22	21	
% English as primary language	88.6	91.3	85.7	.658
N	44	23	21	
Median age in years (range)	38 (28 to 60)	35 (28 to 60)	44 (32 to 58)	.025*
N	34	18	16	
Median years worked in the Emergency Department (range)	5.0 (.5 to 21)	4.0 (.5 to 21)	9.0 (.5 to 20)	.068‡
N	43	22	21	
% Use a computer at home or work	100	100	100	—
N	44	23	21	
% Use e-mail at home or work	88.6	95.7	81.0	.176
N	44	23	21	
% Use internet at home or work	90.7	100.0	80.0	.039*
N	43	23	20	
% Use computer every day	67.4	82.6	50.0	.048*
N	43	23	20	
Self-report to be				.556
% Sophisticated user	25.0	30.0	15.0	
% Unsophisticated user	22.7	15.0	30.0	
% Neither	52.3	55.0	55.0	
N	44	23	21	

N = Total number of clinicians.

**p* < 0.05

***p* < 0.01

†*p* < 0.001

‡ Statistical trend (*p* < 0.10 & *p* > 0.05).

analysis was performed with version 11.5 of the SPSS statistical program (11).

RESULTS

One hundred fifteen clinicians were eligible for the study; 37 physicians and 78 nurses. Forty-four clinicians (23 physicians and 21 nurses) completed and returned the questionnaire. The overall participation rate was 38.3% (95% CI, 29.4–47.2%); 62.2% physicians (95% CI, 46.6–77.8%) and 26.9% nurses (95% CI, 17.1–36.7%).

The majority of the clinicians were female (58.1%), white/non-Hispanic (53.5%), with a median age of 38 years (range: 28 to 60). English was the primary language spoken at home (88.6%). The median number of years worked in the ED was 5 (range: 0.5 to 21 years). There were significant demographic differences between the physicians and nurses. More nurses were female (*p* < 0.001), non-white (*p* < 0.01), and older (*p* < 0.05) as compared to the physicians. In addition, there was a trend for the nurses to have worked more years in the ED (*p* = 0.068) (Table 1).

All physicians and nurses use a computer, other than the EMR. More physicians report use of the internet (*p* < 0.05) and a computer everyday (*p* < 0.05) (Table 1).

All the clinicians were trained and use the ED EMR to enter and view patient data. Thirteen clinicians (29.5%), 6 physicians and 7 nurses, also use it to get specific medical advice, and 7 clinicians (15.9%), 2 physicians and 5 nurses, use it for educational purposes. Eighty-seven percent of physicians and 85.7% of nurses use the ED EMR every day (*p* = 1.000); the rest use it only several times a week. A similar percentage (81.8% physicians and 85.0% nurses) self-reported to have access to the ED EMR from any place in the clinical setting (*p* = 1.000).

Physicians and nurses find it easy to enter data (*p* = 1.000); access data (*p* = 0.348); and read text on the screen (*p* = 1.000). However a high percentage in both groups found it confusing to follow the sequence of screens (*p* = 0.967) (Table 2).

Nurses tend to view the ED EMR as more helpful in their work than do physicians. A majority of nurses report that with EMR they are able to finish work much faster than before; the opposite is true for the physicians (*p* < 0.05). Although not statistically significant, a higher percentage of nurses than physicians perceive that an EMR will eliminate paperwork (95.2 vs. 77.3, respectively, *p* = 0.185), and will reduce the risk of errors (57.1 vs. 34.8, respectively, *p* = 0.137). A majority in both groups report that with the EMR, they are better able to

Table 2. Perceptions of Electronic Medical Record on Current Use, Work, and Patient Care

	All % Agree (N)	Physicians % Agree (N)	Nurses % Agree (N)	<i>p</i> Value
Current use				
Easy to enter data into EMR	93.0 (43)	90.9 (22)	95.2 (21)	1.000
Easy to access data from EMR	88.6 (44)	82.6 (23)	95.2 (21)	0.348
Easy to read text on the computer screen	79.5 (44)	78.3 (23)	81.0 (21)	1.000
It is confusing to follow the sequence of screens	56.8 (44)	56.5 (23)	57.1 (21)	0.967
Impact on work				
With EMR, I am able to finish my work much faster than before	40.9 (44)	21.7 (23)	61.9 (21)	0.013*
EMR will eliminate a lot of paperwork	86.0 (43)	77.3 (22)	95.2 (21)	0.185
EMR will reduce my risk of making errors	45.5 (44)	34.8 (23)	57.1 (21)	0.137
With EMR, I am better able to monitor patient progress	73.8 (42)	81.8 (22)	65.0 (20)	0.298
Impact on patient care				
EMR will improve the quality of medical care received by the patients	43.9 (41)	42.9 (21)	45.0 (20)	0.890
EMR will make patient care less expensive	39.5 (38)	40.0 (20)	38.9 (18)	0.944
EMR will decrease patient waiting time	23.3 (43)	13.6 (22)	33.3 (21)	0.162
EMR will decrease the number of laboratory tests	20.9 (43)	9.1 (22)	33.3 (21)	0.069**
EMR will decrease the number of ED visits	2.3 (44)	0.0 (23)	4.8 (21)	0.488
EMR will decrease crowding in the ED	9.1 (44)	8.7 (23)	9.5 (21)	1.000
Patient information is more confidential with EMR than with paper records	58.1 (43)	45.5 (22)	71.4 (21)	0.084**

N = Total number of clinicians.

* $p < 0.05$

** Statistical trend ($p < 0.10$ & $p > 0.05$).

monitor patient progress (65.0% nurses and 81.8% physicians, $p = 0.298$) (Table 2). A concern stated by clinicians with respect to EMR systems in general is the amount of time required to perform a task. Comments provided included: "Some staff are not that computer literate and it takes awhile for them just to enter information into the system," "Downtime, freezing, logging off between sessions, amount of time it takes to log on," "EMR could be better streamlined to help minimize the amount of time spent at the computer, especially when doing examination notes," "It is very time consuming to order a ...," and "Staff tends to spend more time in front of the computer than with the patients."

The responses to the perceptions on quality of patient care are summarized in Table 2. A majority of physicians and nurses report that the ED EMR will not improve the quality of medical care received by the patients ($p = 0.890$); will not make patient care less expensive ($p = 0.944$); will not decrease patient waiting time ($p = 0.162$); will not decrease the number of laboratory tests ($p = 0.069$); will not decrease the number of ED visits ($p = 0.488$); and will not decrease the crowding in the ED ($p = 1.000$). A few clinicians stated that security of patient information is a concern they have with this EMR and with EMR systems. One nurse stated, "I'm still doubtful regarding confidential information that can be accessed by hackers or non-medical workers," and a physician stated, "I have the concern for the ability to maintain confidentiality (i.e., hackers getting into the system)." Although nurses and physicians state security of patient information to be a concern, most nurses (71.4%) but not most physicians (45.5%) perceive that patient in-

formation is more confidential with EMR than with paper records ($p = 0.084$).

Over 75% from both groups report that in the future, the EMR used in the ED will function properly most of the time with minimal "down time" (81.3% nurses and 81.0% physicians; $p = 1.000$) and that widespread use of EMRs would improve health care in the United States (76.5% nurses vs. 85.0% physicians; $p = 0.680$). Additionally, the majority of clinicians (77.8% nurses vs. 91.3% physicians; $p = 0.377$) in this study would like for all clinicians to computerize their medical records. Both nurses and physicians even expressed a preference for their personal health care provider to maintain their medical information in an EMR (Figure 1).

A few clinicians gave suggestions for ED EMR improvement to cover such aspects as "user-friendliness," ability to write text, and placement of the workstation in a private area. A sample of specific comments included the following: "Better information flow, better organization of data entry and retrieval," "Allow for writing patient information on the EMR and do not rely only on clicking pre-programmed icons," and "Place the computers in a secure area so that staff are not interrupted when patients and family are asking questions."

DISCUSSION

In this cross-sectional survey, we assessed EM physician and nurse satisfaction with an ED EMR. Thirty-eight percent of the 115 eligible clinicians participated in the

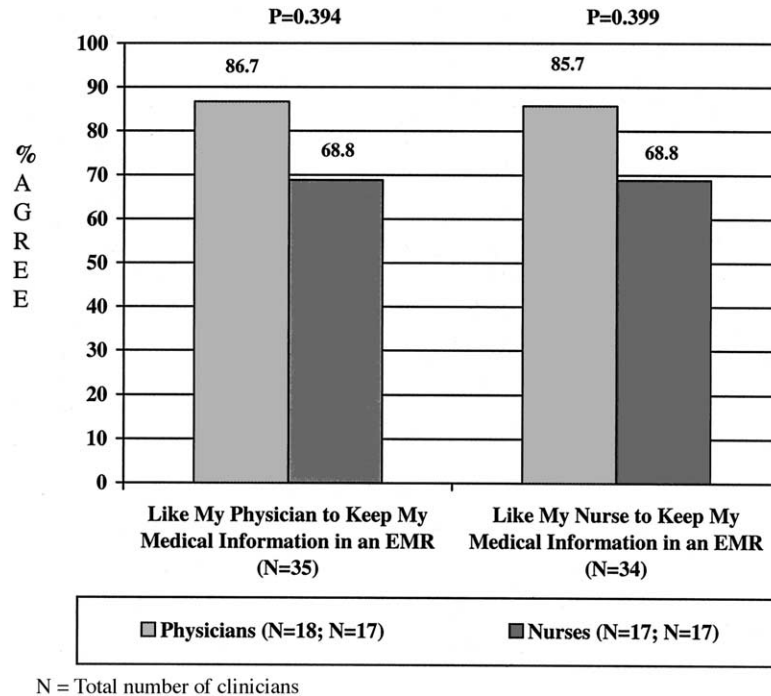


Figure 1. Clinician’s attitudes about own medical information and EMR.

study. The participation rate was high among the physicians, but low among nurses (62.2% vs. 26.9%, respectively). We speculate that this difference may be due to the fact that the physicians were more familiar with the research staff and with research endeavors and thus more comfortable in completing the questionnaire. Demographic and socioeconomic factors may also potentially play a part in this difference, in view of the differences that were noted between the ED physician and nursing staffs. For example, in our study the majority of the nurses were non-white, female, and chronologically older in contrast to the physicians. Although we cannot speculate whether or not these factors or other factors unaccounted for demographic, socioeconomic, and educational differences had a secondarily causal relationship, it is important to note the distinctions between the two groups.

The physicians and nurses in our study were all employed in the ED for an average of 7 years and, thus, they were likely to be familiar with departmental and hospital policies, and could identify any differences before vs. after implementation of the EMR. This is key to being able to accurately evaluate the impact the EMR has or will have on workload and patient care. Additionally, all the clinicians were trained and use the EMR; most use it every day. Thus, they were all familiar with the EMR and could evaluate it accurately. Furthermore, there were no language barriers to understanding and using the EMR.

Overall, we found that clinicians positively perceive the EMR as helpful in their daily work. Physicians and nurses reported that entering, accessing, and reading data is easy with the EMR and that the ED EMR will likely eliminate a lot of paperwork and improve their ability to monitor patient progress. The nurses also report that they are currently able to finish work much faster as compared to the previous paper and pen system.

Despite these reported potential benefits to the work environment and patient care, the clinicians in this study perceive the EMR to currently have minimal impact upon patient care. Both physicians and nurses reported their beliefs that the EMR will not yet improve the quality of care, will not reduce costs, will not decrease waiting times, will not lessen the number of laboratory tests, will not reduce the number of ED visits, and will not attenuate ED overcrowding. They also expressed fears about security, privacy, and confidentiality issues. These sentiments are of potential concern, especially because many EMRs claim to improve efficiency, reduce costs, and improve the overall quality of care (1,3). We must caution against over-extrapolation of these findings from our study, due to the short duration of experience with EMR use as a result of its implementation less than 1 year before this survey. In addition, this study only represents the findings from one particular ED and one particular acute-care institution. It is entirely likely that the clinicians’ sentiments would differ in other institu-

tions and even within our ED after more experience with the EMR, and hence greater familiarity and comfort with the system. Even though the physicians and the nurses expressed concern about the current ability of the EMR to meet its intended purposes, both groups expressed optimism for an EMR to improve care and achieve systematic efficiency in the future.

Over 75% of the clinicians in this study expressed a preference for physicians and other clinicians to computerize their medical records. The majority of respondents also expressed a preference that their personal healthcare providers maintain their medical information in an EMR. This finding may indicate that, although concerns exist with respect to confidentiality, efficiency, and related issues, a general consensus among all respondents is that the technology will improve and provide the perceived benefits in the future.

Similar to Loomis et al., our survey had a high percentage of physicians and nurses who used a computer, used e-mail, used the Internet; and very few self-identified to be unsophisticated computer users (8). Therefore, we were not able to compare computer literate vs. non-computer literate clinicians and satisfaction with an EMR.

The major limitation to this study is that it consists of findings from one ED at one institution, with a low nurse response rate, and at one particular point in time (12). Thus, the results could be quite biased by reflecting the opinion of these very few respondents (12). Clearly, a higher nurse response rate within this institution, and a larger overall sample size drawn from multiple institutions across the country, would ensure greater validity and reliability of our findings, and would also facilitate widespread exportability and extrapolation to other settings, systems, and environments (12). Furthermore, the results may not necessarily reflect the generic issues related to an ED EMR but, rather, may merely reflect the characteristics of a particular system employed by an ED and its hardware and software components. Further work should therefore include a large sample of respondents from multiple sites and centers that use different EMR platforms. The EMR in this study is one type and some results, particularly regarding use, may be specific to this EMR.

CONCLUSIONS

This study suggests that EM physicians and nurses favor the use of an EMR and believe that EMRs can

potentially improve ED efficiency despite current concerns about its effect and impact. Physicians and nurses differed in their perception, as nurses reported greater satisfaction in assistance with their tasks, whereas physicians reported minimal change. Further work needs to be done with various EMRs at multiple settings.

Acknowledgment—We acknowledge Irena Aronsky, Peggy Hainke, Sawara James, Anne Bissesar, and Alla Veksler for their valuable administrative or data collection assistance on this research project. We also thank all the physicians and nurses who were kind enough to return their questionnaires and participate in the study.

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