Differing Faculty and Housestaff Acceptance of an Electronic Health Record One-Year After Implementation

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Abstract

In order to determine whether differences exist between housestaff and faculty physician acceptance of an electronic health record system, we conducted a written survey of attitudes towards new electronic medical record at the University of Illinois at Chicago. We surveyed 330 faculty and housestaff physicians. User acceptance of the EHR was high for both faculty physicians and housestaff. 88.0% of the housestaff and 64.7% of the faculty preferred the EHR over a paper record. Although both housestaff and faculty acceptance of an EHR was high, housestaff showed greater approval ratings than faculty. Central to acceptance of an EHR is conservation of physician time including improving system speed, reducing time spent waiting for a computer to become available, and minimizing time spent documenting care.

Keywords:
Surveys, attitudes to computers, computerized patient records

Introduction

In 1991 the Institute of Medicine issued an influential white paper arguing that the computer based medical record would be an essential technology for the future of healthcare [1]. Despite this endorsement, electronic medical records (EHRs) have disseminated slowly [2, 3]. EHRs promise improved quality of care, increased completeness and legibility of documentation, immediate access to information at widely distributed sites, immense clinical data warehouses, decision support technologies, and improved workflow. The slow spread of EHRs has been attributed to a variety of factors including high cost, lack of mature products, and complexity of building and implementing systems. Another critical factor has been low physician acceptance of EHRs. Sittig et al. [4] have written, "a limiting factor in realizing the full potential of electronic medical records (EMR) is physician reluctance to use these applications." Although a variety of studies, have begun to examine physician attitudes about EHRs, a clear picture of faculty and housestaff physician attitudes about a full-text electronic medical record has not yet emerged [4-10]. Since physician attitudes are a key factor in the implementation of EHRs, we have assessed faculty and housestaff physician attitudes towards a full-text EHR in a large academic group practice one year after implementation. We hypothesized that since housestaff were likely to be younger and more computer literate than faculty physicians that they would have more positive views of the EHR.

Methods

During August of 1999, an electronic health record (PowerChart™, Cerner Corporation, Kansas City, MO) was deployed in the newly built Outpatient Care Center (OCC) and the University of Illinois Hospital [11]. The OCC was designed without storage space for paper medical records. Reliance upon an EHR that provides for both documentation of patient care and retrieval of laboratory and radiological information was integral to the vision of the facility. During August of 1999, physician users (both faculty and housestaff) from 14 clinics were mandated to use the EHR. During November of 1999, computerized physician order entry (CPOE) was implemented on all inpatient units of the University of Illinois Hospital. The new EHR had the following characteristics: use of the EHR was mandatory for creating notes, viewing documents, and reviewing laboratory and radiology results in the Outpatient Care Center; prior paper records were made available through a document scanning system; paper was unavailable for new note creation in the Outpatient Care Center; electronic note documentation was optional on the inpatient units; computerized physician order entry was mandatory for all inpatient units; the EHR was deployed across all Outpatient Centers simultaneously.

Approximately one year after the EHR implementation, we surveyed faculty and housestaff physician attitudes toward the new EHR. We used a written survey instrument to gather information in four categories: (1) demographics, (2) computer experience and expertise, (3) opinions about the utility of the EHR in performing various tasks, and (4) perceived barriers to more effective use of the EHR. The final version had 38 items. The "Demographics Section" surveyed users with regard to years in practice and hours per week in the Outpatient Care Center. Age, gender, department affiliation and years on staff were ascertained from a housestaff database and physician group practice data. The "Computer Background" section consisted of 5 Likert-style questions about frequency of computer use at work, computer use at home, e-mail use, typing skill, and "office suite" software skill. It also contained a multiple-response-type question on how respondents documented outpatient care (direct note entry, use of templates, or dictation). The "Attitudes about EHR" section contained 19 Likert-style questions that assessed

respondents' opinions about EHR features, functionality, and performance. The "Barriers to More Effective Use" section consisted of 8 Likert-style questions that assessed respondents' perceptions of factors that they thought might limit fuller utilization of the EHR.

We identified survey subjects from a database of current UIC faculty physicians maintained by the Physician Group Practice and a roster of housestaff physicians maintained by the Graduate Medical Education Office. The survey was reviewed and approved by the UIC Institutional Review Board to protect human research subjects. Surveys were packaged together with an explanatory cover letter. Surveys were serially numbered to track responses. 909 surveys were distributed. Data from the returned surveys were entered into SPSS for Windows (release 10.0). Means, standard deviations, Fisher exact tests, and chi-square tests were calculated by standard methods. Analysis of variance and T-tests were used to compare means where appropriate.

Results

We received 330 valid responses (36.3 % response rate). The response rate was higher for faculty (47.1%) than for housestaff (31.2%, df= 1, p <. 001).

Computer Literacy. Computer literacy was high among respondents. Daily computer use at work was over 86% for both housestaff and faculty physicians (difference not statistically significant). Daily computer use at home was higher for housestaff (57.4%) than for faculty (43.6%, df=1, p> 0.01). Email use was extensive. A majority of housestaff (73.3%) and faculty (84.3%) reported checking their email at least once per day (df=1, p< 0.01). Familiarity with "office suite" software was high; only 9.3% of the faculty 2.6% of the housestaff reported an inability to use "office suite software" (groups differ, df=1, p <0.01). Respondents were proficient at typing; 53.9% of housestaff and 55.0% of faculty reported "touch typing" skills.

Note Entry Practices. Since The EHR was implemented, physicians have been encouraged to enter their patient notes directly into the system by either direct note entry or by editing built-in note templates. Dictation of notes is available but incurs additional costs. Among respondents, more faculty (34.9%) used dictation than housestaff (18.1%, df=1, p< 0.01). There were no significant differences between housestaff and faculty physicians in the use of templates or direct note entry.

User Attitudes. User acceptance of the EHR was high for both faculty physicians and housestaff. However, satisfaction was statistically significantly higher for housestaff than faculty in a number of areas (Table 1). Among housestaff, 88.0% preferred the EHR over a paper record and 75.3% said they enjoyed using the EHR. Only 64.7% of the faculty said they preferred the EHR over paper and 60.6% said they enjoyed using the EHR (df=1, p< 0.01). Based on these survey questions, we rated 88% of the housestaff and 64.7% of the faculty as EHR preferrers. Housestaff and faculty agreed that the EHR increased availability of medical records, eased determination of the treating physician, increased the ability to communicate with other physicians (notes can be forwarded electronically), increased the legibility of documentation, and eased access to laboratory results. Signif-

icantly more of the housestaff responded that the EHR increased availability of medical records, increased the legibility of the medical record, made workflow more efficient, increased completeness of documentation, saved time documenting care, and increased record security.

Table 1: Table . Faculty and Housestaff User Attitudes Towards the EHR (Percent agreeing)

Opinion	Housestaff Users (N=191) (%)	Faculty Users (N=139) (%)
Increases availability of Information*	93.7	86.9
Increases ability to communicate	91.1	87.7
Increases legibility*	90.6	78.3
Prefers an EHR*	88.0	64.7
Easier to determine treating physicians	87.5	82.7
Eases access to lab results	84.7	83.9
Easy to use*	78.5	56.3
Enjoy using the EHR*	75.3	60.6
Workflow more efficient*	68.9	49.6
Increases completeness*	60.7	45.7
Reduces unnecessary testing	56.3	49.6
Prevents patient care errors	51.6	42.1
Saves time documenting care*	51.6	33.1
Increases record security*	39.6	19.3

*Fisher exact test, Groups differ, p < 0.05

We used univariate statistics to identify factors that might predict physician membership in the EHR preferrer set. For faculty physicians, years in practice (mean 15.6 ± 8.7), years on staff (mean 8.1 ± 6.7), age (mean 46.5 ± 8.9), and outpatient clinic hours per week (mean 12.8 ± 9.3), did not predict EHR preferrer status. Similarly, for housestaff physicians, years of postgraduate training (mean 3.6 ± 1.9) did not predict EHR preferrer status. Men (81.4%) were somewhat more likely to be EHR preferrers than women (71.6%, df=1, p = .04). Type of practice; Medical, Surgical, or Other (Obstetrics, Radiology); did not predict EHR preferrer status (df=1, p=. 685).

Barriers to increased use of the EHR. Respondents were surveyed as to what they thought were the barriers to increased use of the EHR. (Table 2). Both faculty and housestaff responded that system speed was the greatest barrier to increased use of the EHR. Housestaff were more likely to cite lack of computers as a barrier, whereas faculty were more likely to cite a confusing user interface, a lack of understanding of EHR features, and a lack of computer skills (df=1, Pearson Chi Square, P <0.05, Table 2).

Discussion

We survey physician attitudes towards a full-text electronic health record with CPOE one year after its implementation in a large, diverse multispeciality academic group practice with attached university hospital. Overall response to the EHR has been favorable with 78.2% of our surveyed users expressing a prefer-

ence for the electronic health record over the previous paper record. Although, both housestaff and faculty hold positive views, housestaff perceptions were consistently more positive than that of faculty (Table 1). Housestaff (88.0%) were more likely to be <u>EHR preferrers</u> than faculty (64.7%, df=1, p<. 01).

Table 2: What are barriers to increased use of the EHR system?

Barrier	House-staff Users (N=191)(%)	Faculty Users (N=139) (%)
Slow system speed	94.3	94.2
Lack of computers**	**87.5**	**58.8**
A confusing user interface**	**40.7**	**59.0**
Concerns about patient confidentiality	40.3	37.7
Lack of training on EHR	40.1	45.6
Lack of understanding of EHR features**	**39.1**	**49.2**
Lack of typing skills	26.7	33.3
Lack of computer skills**	**16.8**	**24.8**

**Groups differ, Pearson chi-square test, df=2, p <. 05

Based on our survey, a majority of both housestaff and faculty believed that the EHR increased availability of medical records, eased the determination of treating physician, increased the ability to communicate with other physicians, increased the legibility of documentation, and eased access to laboratory results (Table 1). Although a majority of housestaff believed that the EHR made workflow more efficient, reduced duplicate or unnecessary testing, saved time documenting care, and reduced patient care errors, less than a majority of the faculty shared their view on these questionnaire items. A minority of the housestaff and the faculty believed that the current EHR increased medical record security (Table 1).

In contrast to previous studies [12-13], we found that our respondents had mostly good typing skills and computer skills. Few users cited lack of computer skills, lack of typing skills, or inadequate training as a "significant" barrier to use of the EHR (Table 2). The most commonly cited barriers to increased use of the EHR were system speed (response time). Physicians have cited response time as critical to acceptance in other studies [4]. Housestaff were also concerned about the availability of computers (in actuality another surrogate for "time" since waiting for computer availability translates into lost time for housestaff). Another key issue is time spent documenting care. Only 51.6% of housestaff and 33.1% of faculty believed that the EHR saved them time in the care documentation process. Clearly, time is a key issue that determines physician acceptance—whether it is time waiting for the system to respond, time spent waiting for a computer to become available, time spent placing orders, time spent retrieving laboratory results, or time spent documenting care. Healthcare organizations implementing EHRs and vendors selling EHRs need to put "conserving physician time" at the top of their lists if they are going to obtain physician buy-in and acceptance [14].

Consistent with our initial hypothesis, housestaff showed a higher acceptance for the EHR than did faculty (Table 1). We can only speculate as to the reasons for this higher acceptance. Typing skill, computer use, and email use did not separate the housestaff from the faculty. Perhaps housestaff are more ready to embrace a new technology, but we did not assess this attitude in our survey. Although housestaff are younger than faculty, it is not clear that age was a critical determinant of acceptance. Among the faculty, age did not predict acceptance. Among the housestaff, years of postgraduate training did not predict acceptance. We speculate that housestaff acceptance of the EHR may reflect differences in how housestaff and faculty function and use the EHR. At our hospital, housestaff can review results, place orders, and create documentation from within the EHR. This is a significant time-saver for housestaff who can do "one-stop shopping" within the EHR. On the other hand, faculty tend to rely upon housestaff to place orders and to obtain laboratory results so that their use of the EHR is less intense and often limited to documentation processes. For faculty, the advantages of the EHR which includes the ability to retrieve results, place orders, and produce documentation from within a single computer session may be less compelling.

Two limitations of this study need to be mentioned. First, this survey was completed early after implementation of the EHR. System speed (performance) and functionality have improved since the time of the survey. Physician familiarity with the EHR and its features is more mature. In addition, the size of the clinical repository has grown (clinical documentation, laboratory results, radiology findings) enhancing the value of this repository. Furthermore, the growth of the clinical documentation database can enhance the speed of repeat visit documentation through a process of "cut, paste, and edit" which allows prior notes to serve as templates for new notes. All of these factors make it likely that faculty and housestaff perceptions of the system are now more positive than they were at the time of survey. A second limitation is our response rate of 35.2%. It is possible that the physicians that were non-respondents had different, and more negative, views of the EHR than our respondents. As a general principle, one may assume that non-respondents probably hold more negative views than respondents. We believe that our survey is representative of physician opinion about the EHR, although it may underestimate the size of the group that has negative perceptions about the EHR.

Conclusion

Although physician acceptance was high, housestaff expressed higher approval ratings for the EHR than did faculty. The explanation for the higher approval by housestaff is uncertain, although we speculate that it may be due to the more intensive use of the EHR by the housestaff as compared to the faculty. We speculate that the EHR is a bigger time saver for the housestaff than the faculty. Issues of time conservation are critical to both faculty and housestaff including time expended waiting for the system to respond, time spent retrieving results, time spent placing orders, time spent waiting for a computer or terminal to become available, and time spent documenting care. In the end, time may be a critical determinant of EHR acceptance. Imple-

mentations of EHRs that successfully conserve physician time will be accepted; those that do not will be a difficult sell at best [14].

References

[1] Dick RS, Steen EB, Eds. *The computer-based patient record: an essential technology for health care*. Washington DC: National Academy Press, 1991.

[2] Bingham A: Computerized patient records benefit physician offices. *Healthcare Financial Management* 1997; 51: 68-70.

[3] Berkowitz LL. Diagnosing doctors: four types of physicians require four approaches to promote clinical computing acceptance. *Healthcare Informatics* 1998; 15: 93-94.

[4] Sitting DF, Kuperman GJ, Fiskio J. Evaluating Physician Satisfaction Regarding User Interactions with an Electronic Medical Record System. *Proc AMIA Symp.* 1999; 400-4.

[5] Folz-Murphy N, Partin M, Williams L, Harris CM, Lauer MS. Physician Use of an Ambulatory Medical Record System: Matching Form and Function. *Proc AMIA Symp* 1998; 260-4.

[6] Lee F, Teich JM, Spurr CD, Bates DW. Implementation of Physician Order Entry: User Satisfaction and Self-reported Usage Patterns. *J Am Med Informatics Assoc.* 1996; 3:42-55.

[7] Ash JS, Gorman PN, Hersh WR, Lavelle M, Poulsen SB. Perceptions of House Officers Who Use Physician Order Entry. *Proc AMIA Symp.* 1999; 471-5.

[8] Wager KA, Ornstein SM, Jenkins RG. Perceived value of computer-based patient records among clinician users. *MD Comput.* 1997; 14:334-340.

[9] Gamm LD, Barsukiewicz CK, Dansky KH, Vasey JJ. Pre- and Post- Control Model Research on End-Users' Satisfaction with an Electronic Medical Record: Preliminary Results. *Proc AMIA Symp.* 1998; 225-9.

[10]Lenhart JG. An analysis of trends, perceptions, and use patterns of electronic medical records among US family practice residency programs. *Fam Med.* 2000; 32: 109-14.

[11]Morrissey J. The EHR rising: As powerful computer engine cranks up, medical center can offer more efficient, integrated care. *Modern Healthcare.* 2000; 30:46-49.

[12]Brown SH and Coney RD. Changes in Physicians' Computer Anxiety and Attitudes Related to Clinical Information System Use. *J Am Med Informatics Assoc.* 1994; 1: 381-94.

[13]O'Dell DV, Tape TG, Campbell JR. Increasing physician acceptance and use of the computerized ambulatory medical record. *Proceedings Annual Symposium on Computer Applications in Medical Care,* 1991; 848-852.

[14]Hier DB. Physician buy-in for an EMR *Healthcare Informatics.* 2002; 19:37-40.