

■ *Original Article*

The impact of training on the use of electronic health records

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Abstract

Background: Studies have found that health information technology can improve the quality and efficiency of care delivery through better decision support. **Objective** To gauge the effectiveness of electronic health records (EHR) training that was delivered to health care providers in an academic practice, to leverage feedback from the training evaluation to inform the content and process of training health care providers and to understand the impact of EHR implementation on all facets of health care delivery. **Methods:** A mixed methods instrument was designed to assess learning outcomes (cognitive, attitudinal and behavioral) associated with EHR training. A sample of 220 health care providers who regularly interacted with the EHR system was included. Participants were asked to evaluate cognitive, attitudinal, and behavioral aspects of their training with the EHR system. A multidimensional assessment of learning outcomes was selected. **Results:** On behavioral theme, 50% of our survey respondents answered the questions positively, 28% did not, 16% had mixed feelings, 3% felt EHR had negative impacts and 3% were neutral. On cognitive theme 31% felt EHR had a positive impact, 33% felt it had drawbacks whereas 35% left the answers blank and 1% felt they had no idea. On attitudinal theme, there was positive response from 45%, 21% had negative feelings about the system, 5% were neutral and the rest 25% did not answer. **Conclusions:** In this study, we found that majority of the respondents were satisfied with the EHR for behavioral and attitudinal themes. Future studies with mandatory response to cognitive theme will help figure out the satisfaction of survey respondents on all themes.

Introduction

The Institute of Medicine and Purchaser Coalitions confirms that the use of health information technology in medical practice has grown steadily in the US and is buttressed by considerable state and federal government support. Studies have found that health information technology can improve the quality and efficiency of care delivery through better decision support¹⁻². Some of these benefits included avoidance

of medication errors, greater adherence to health maintenance guidelines and reduction in cost of care^{1,3-4}. EHRs are not without peril. Without proper implementation, training, and system monitoring EHRs can lead to increased medication order errors and increased physician time investment⁵⁻¹⁰.

In 2008, DesRoches et al conducted a survey of a number of physicians in the US regarding their use of EHRs. Of the 2758 reporting physicians (62% response rate) 17 percent used some form of EHR, but only 4 percent have adopted fully functional electronic health records; the rest utilized only the most basic software. The main difference between the basic and fully functional system was the lack of

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order entry and decision support in the basic system. Satisfaction was very high among the physicians using both the basic (88%) and fully functional systems (93%)¹¹.

Several researchers and practitioners have experienced drawbacks to electronic health record implementation. Linder et al¹² found no quality improvement with EHR in an outpatient setting for fourteen out of seventeen quality indicators. EHRs were used in 18% (95% confidence interval [CI], 15%-22%) of the estimated 1.8 billion ambulatory visits (95% CI, 1.7-2.0 billion) in the United States in 2003 and 2004. Performance on quality indicators was defined as the percentage of applicable visits in which patients received recommended care. For 14 of the 17 quality indicators, there was no significant difference in performance between visits with versus without EHR use. Categories of these indicators included medical management of common diseases, recommended antibiotic prescribing, preventive counseling, screening tests, and avoiding potentially inappropriate medication prescribing in elderly patients. For two quality indicators, visits to medical practices using EHRs had significantly better performance: avoiding benzodiazepine use for patients with depression (91% versus 84%; $P = .01$) and avoiding routine urinalysis during general medical examinations (94% versus 91%; $P = .003$). For one quality indicator, visits to practices using EHRs had significantly worse quality: failure to prescribe statins to patients with hypercholesterolemia (33% versus 47%; $P = .01$).

Smith et al concluded that alerts in an outpatient electronic medical record may be an effective method of reducing prescription of contraindicated medications¹³. A study in an ambulatory setting found a thirteen percent reduction of inappropriate prescriptions of long-acting benzodiazepine and tricyclic antidepressants utilizing EHR functions in compared to not utilizing these functions (i.e. clinical decision support¹⁴). A survey of family practice residents by Aaronson et al 2001 reported overall ambivalence and a noticeable frustration toward current EHR systems. They indicated that current EHR systems slow them down, increase their workload in the clinic, and thereby may detract from physician patient relationships¹⁵. By contrast, another study found that paid malpractice claims are slightly lower (although not statistically significant) among

the physicians using the EHRs¹⁶. Further, patients' attitudes about the use of online access to their health records were positive on the survey conducted by Hassol et al¹⁷. Only a minority of patients was concerned about breach of privacy and confidentiality. However, clinicians were less positive about using electronic communications than their patients. There was a significant difference between patients and clinicians about preferred means of communication for different interactions. Clinicians preferred telephone systems whereas patients preferred e-mails¹⁷. Other surveys indicated positive responses from physicians about computer use in general and electronic medical records use in particular¹⁸⁻¹⁹.

The objective of the present study was to gauge the effectiveness of the EHR training delivered to health care providers in an academic practice, to leverage feedback from the training evaluation to inform the content and process of future training employed for health care providers, and to understand the impact of EHR implementation on all facets of health care delivery.

The current study was conducted at a mid-sized (48 specialty and subspecialty programs) health system in the Midwest. Implementation of the EHR (EpicCare, the software from EPIC for Project Automated Records Keeping [ARK]) was done in phases. Study participants were medical students, residents, nurses, clerical personnel and faculty physicians from 2 specialty and one subspecialty programs (community and family medicine, general internal medicine and geriatric medicine). Other departments were not live in the EHR system.

Procedure

The research team attained the appropriate IRB approval to conduct research and gained access to the sample through partnership with members of the department. Participation in the study required health care providers to have completed training on the EHR system, have used the EHR system for at least 3 weeks (to ensure a baseline familiarity), and have had the EHR system implemented in their respective department. Participants were sent an email from the research team regarding the study. Participation was not incentivized and was completely voluntary. Study subjects who wished to participate clicked a hyperlink to the study and were able to fill out the

study online. Once participants finished the survey their participation was concluded and they were thanked for their time.

Sample

Measures

A mixed methods instrument was developed that was in keeping with the best practices of training evaluation²⁰. Recent research in training²¹ has suggested that assessment of learning outcomes in training must address not only satisfaction but must additionally consider changes in cognitive and behavioral constructs. That is, are people thinking and acting differently as a function of training. In addition to the work done in training, a prominent assessment tool, SWOT (strength, weakness, opportunity and threat) analysis, was used to assess what portions of the training and implementation of EHRs was going well (strengths) and what was not going as well (weaknesses); further items were generated to establish potential revisions to training from the viewpoint of a key stakeholder group (healthcare providers) or the opportunities and threats segment.

Data analysis

Given the descriptive and exploratory nature of this study measures of central tendency (e.g., mean) and measures of spread (e.g., standard deviation) were the primary takeaway metrics of the current research in order to establish a baseline for several learning outcomes. Exploratory inferential tests of group differences (e.g., ANOVA) by health care provider

type were conducted to determine if groups meaningfully differ on any of the learning outcomes; no differences were explicitly posited. Measures of effect size between groups were collected to determine the magnitude of any constructed statistical significance.

Qualitative items were content analyzed²² for themes by the research team in a two wave iterative process. First raters content analyzed items independently and then came together as a group and through several iterations arrived at mutually agreed upon themes overall by health care provider type (where sample size permitted).

We received forty-one responses out of two hundred surveys. Twenty surveys did not reach the participants due to erroneous e-mail addresses. The study’s response rate was twenty one percent excluding the group with erroneous e-mail addresses (otherwise nineteen percent). We grouped the participants into trainee group (young generation), faculty and support staff most of whom were middle aged (older generation). Trainee group (residents and medical students) comprised twelve percent of the responses whereas faculty physicians comprised forty three percent and support staff comprised of twenty four percent of responses. . This survey was sent anonymously by Zip Survey. As anticipated, the survey response was fairly low due to the fact that this was a pilot project. SPSS version 16 was used to analyze the data. P values of less than 0.05 were considered to indicate statistically significant differences. P values were not adjusted for multiple comparisons.

Results

Table I: Survey response rates among the participants

Support Staff		Trainee Group		Physicians	
Sent	Responded	Sent	Responded	Sent	Responded
42	10	148	18	30	13
Group Response Rate	24%	Group Response Rate	12%	Group Response Rate	43%
Overall Response Rate	21%				



Figure 1

In analyzing survey response it was evident that most of our residents and medical students have responded favorably to electronic health records in general and training in particular even though the first training of the residents was unstructured and on the fly because of difficulty in fitting the training sessions into their work schedule.

Overall, most of our providers were not satisfied with their training. It was felt that the training should have been more structured and should have more devoted hands-on time during these sessions. This response led to incorporating an additional hands-on component during the next training sessions.

The following themes were apparent in the open ended questions sent to the survey recipients. We group them into behavioral, cognitive and attitudinal.

Behavioral theme

Item: Item 8 – How has the implementation of Project ARK changed your job?

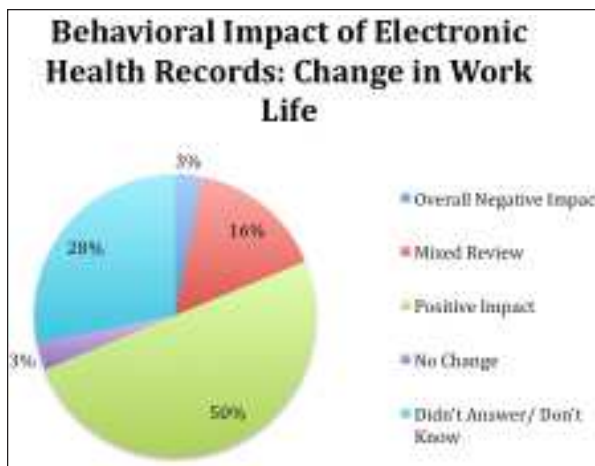


Figure 2

Overview of positive responses: Easier access, better organization, less redundancy, more efficient.

Positive quotes

“It has improved access to patients charts which in turn improves care”

“Don’t have to write messages twice anymore” “I hope we never go back to paper”

Overview of negative responses: More time intensive, EHRs are a passing fad, patient communication (more awkward, of a poorer quality).

Negative quotes

“I feel like I am having an having a love affair with the computer (cheating on the patient)”

“Added 2-- 3 hours per clinic day, less time for teaching and administration”

“Feel the focus is generally on “humoring” the EHR encounter.

Cognitive theme

Item: Item 18/19 – What are the single largest benefits and drawbacks associated with the EHR system?

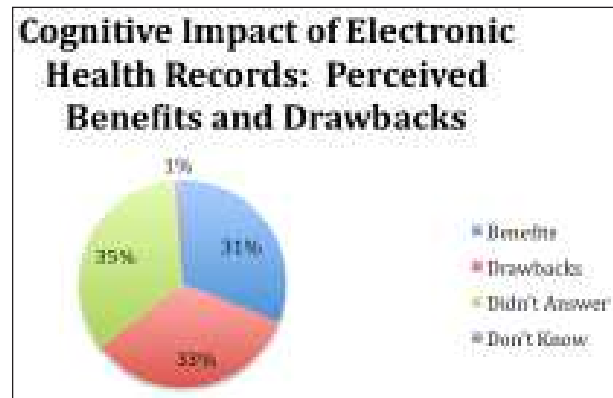


Figure 4

Overview of positive responses: Quicker, more reliable, easily transferrable access to and of documentation of patient’s health.

Positive quotes

“I know have patient information at a single click of a button” “I can use this (EHRs) anywhere”

“Finally one chart per patient helps communication between providers immensely”

Overview of negative responses: “Some software inadequacies (e.g., locked out of system), steep learning curve, increases time at first.

Negative quotes

“Often locked out and must consult customer support”

“Not initially user friendly, but was easier with continued use”

“System required trouble shooting, aspects of the software were not written for medical professionals”

Attitudinal theme

Item: Item 21 – Is information technology support for our EHR system satisfactory?

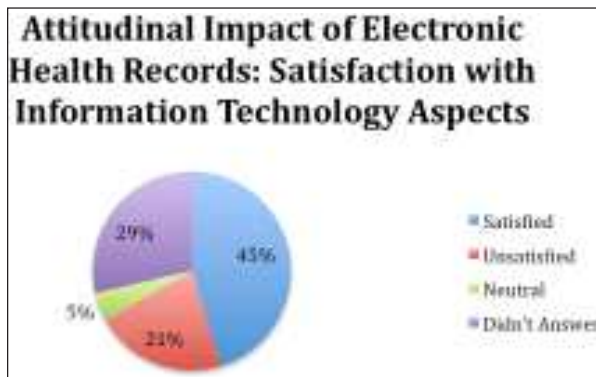


Figure 3

Overview of positive responses: Generally low in content here, simply reported satisfaction with IT function.

Overview of negative responses: Feedback loop often left open, not always available, Billing issues are still poorly addressed.

Negative quotes

“Need 24 hours support.”

“I often do not get responses to queries submitted to the Help Desk.”

“Billing, printing, and scanning need work.”

Some providers felt that over-documentation is a big issue with the electronic health records. It is easy to pull in a big chunk of text that may not have clinical relevance. Of course, one can delete the part of the text that is not useful or has not been used.

Discussion

EHRs are helpful to solve some of the problems facing US Health system in the twenty first century. In 2004, then President George W. Bush proposed

that electronic health records should be in widespread use by 2014. This vision was strengthened when President Obama earmarked 19.2 billion dollars dedicated to health information technology infrastructure in the stimulus package of 2009²³. Medical literature is rich with information about EHR systems. The current research is particularly relevant to practitioners and researchers alike because little attention has been paid to understand how EHR systems can be made more effective. Without such information, how an hospital administrators implement EHR systems so that they will enjoy the potential benefits and minimize any adverse impact? We posit training/iterative revision of training programs based upon health care provider feedback as levers for activating the benefits of EHRs while uncovering and attenuating the potential negative impacts of EHRs.

This survey was sent to eligible providers (medical students, residents, clerical staff, nurses and physicians) and utilized a multidimensional assessment of learning outcomes²¹. Respondents felt that EHR increased their efficiency to communicate with their patients and their colleagues. EpicCare makes it very easy to generate and send a letter to patients and colleagues.

Most respondents also agreed to the statement that EHR improves the efficiency of care. Some of these benefits included avoidance of medication errors, greater adherence to health maintenance guidelines and reduction in cost of care^{1-4,24}. It seems most of our providers were neutral with regards to avoidance of medication errors. Our study did not factor in the cost of care. Other studies have pointed out the downside of using the EHR which include increased medication order errors and increased physician time investment⁵⁻¹⁰. Some of the open ended responses from our providers showed their concerns about over-documentation and, therefore, it could be one of the significant compliance issues. This happens because it is very easy to pull in a lot of previously entered information without verifying the information with the patients particularly if one is completing the encounter documentation after the office visit using EpicCare’s smart phrases and smart texts. Most of our providers clearly mentioned in their response that the system did not save their time because data entry takes time even for the fastest transcriptionist. Most of the providers’ typing speed is fairly slow.

Smith DH et al (year) concluded that alerts in an outpatient electronic medical record may be an effective method of reducing prescription of contraindicated medications¹³. Our best practice alerts have not been implemented and therefore it remains to be seen whether it is true in our practice. Survey of family practice residents by Aaronson JW (year) et al showed overall ambivalence and a noticeable frustration toward current EHR systems. They indicated that current EHR systems slow them down, increase their workload in the clinic, and thereby may detract from physician patient relationships¹⁵. Our residents had used Veteran Affairs administrations' computerized patient record system (CPRS) system where they can freely type in their notes. They claim that complexity of Epic slows them down more than free texting; perhaps their typing speed is better than their attending. Equally important in this argument is the fact that there is a significant problem with training. We felt that, in addition to their attending physicians' teaching, periodic training in the use of the system will improve their knowledge and skills of various smart tools available in Epic.

Gist et al (year) report that older trainees exhibited significantly poorer performance than did younger trainees in both the modeling and the non-modeling training conditions²⁵. It is apparent that if future cohorts of older adults are to continue to function independently, society will need to identify effective computer interfaces and training techniques²⁶. In general, older people perceived less comfort, efficacy, and control over computers than did the other participants. The results also indicated that experience with computers resulted in more positive attitudes for all participants across most attitude dimension²⁷. Findings of PEW research showed 93% of young adults now use internet whereas only 38% of adults over 65 years and 70% of those between ages of 50-64 use internet²⁸. We believe using internet for checking e-mail or other leisure activities and using internet for the professional activities are different and therefore our study showed the discrepancy between our trainees and staff. Perhaps if the study is repeated after several years, results could be different because comfort level of the older adults may improve with experience with the computer software.

One of the limitations of our study is low survey response rate. Perhaps the vast majority of non respondents might have different opinion with regards to difficulties encountered in the post implementation period. We tried to improve the survey response rate by resending the survey after one week. Perhaps, we would have more responses, had we sent the survey one or two months after initial e-mail. Second, this is a single center study and, therefore, our findings may not be generalizable. Lastly, challenges encountered are different at different points in time; this study captured only one point in time. We are planning to do a survey of our new residents to capture the challenges at different time points.

This was a pilot project. Although the survey response rate was low, nonetheless we have learned important lessons from this project. Clearly the training was inadequate prior to "going" live; there should have been greater concentration on a more structured and lengthier training, perhaps for at least one month before implementation.

This was more important for the residents given their busy work schedule and tighter residency hour regulations. Training should have included more hands-on sessions rather than classroom teaching. This study helped us streamline the training program not only for next batch of residents but also staff and faculty of other divisions of department of internal medicine and other departments. Future surveys will be done using smaller groups for training to see if this finding can be replicated. The next survey will concentrate only on new residents to see if the current findings of the young doctors training and attitudes towards electronic health records can be replicated.

Conclusion

This study showed that majority of the survey respondents were satisfied with the EHR for behavioral and attitudinal themes but it is not known from their response for the cognitive theme. Perhaps, making the answers mandatory will help us figure out their exact response on this theme in our subsequent surveys. Additionally, medical students and residents had a higher level of satisfaction with the EHR when compared to physicians, nurses, and clerical personnel. This trend if replicated in future studies should help policymakers to focus on developing methods to make EHR more palatable to

all physicians for its successful nation-wide implementation

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