Prior Experience and Physicians’ Intentions to Adopt EMR

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Abstract

Electronic Medical Records (EMR) are expected to increase efficiency, quality of care, and patient safety, yet most studies find that fewer than 25% of hospitals and physicians have adopted them. Theories posit that prior experience with EMR in medical school and residency programs will lead to greater acceptance of EMR among physicians. This work explores the potential relationship between prior experience and adoption of EMR technology among physicians.

1. Introduction and Theoretical Framework

The Electronic Medical Record (EMR) has been heralded as healthcare’s avenue to improved quality of care, improved patient safety, and increased efficiency. Yet, studies consistently find only 20-25% of physicians, physician offices, and hospitals have actually adopted EMR [1, 2, 3, 4, 5, 6, 7]. Physicians appear reluctant to accept and use EMR [8, 9]. Commonly cited barriers to adoption include the interruption of traditional practice patterns, lack of evidence regarding the benefits of EMR, organizational issues, and IT system specific issues [3]. Additional concerns include security, financial, and technical issues [2]. A final reason for physicians’ continued reliance on paper-based medical records might be “The fact that the information being paper-based makes it difficult for patients to change their primary care physicians. This is a major incentive for physicians to resist changing to easily portable EMRs” [10].

The Technology Acceptance Model (TAM) has been the dominant theoretical approach for studying individual IT adoption (for a thorough discussion of TAM and EMR adoption among physicians, see [3]). TAM is an adaptation of the Theory of Reasoned Action (TRA). It posits that perceived usefulness and perceived ease of use determine an individual’s intention use a system [11]. TAM, however, is not without criticisms or limitations [12]. TAM may be powerful in terms of prediction, yet it has proven much weaker in terms of producing actionable knowledge [13]. Closely related to TAM, yet more comprehensive in approach, is the Unified Theory of Acceptance and Use of Technology Model (UTAUT), which holds four key constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. In addition, UTAUT provides for four mediating factors: gender, age, experience, and voluntariness of use [14].

This study focuses on one specific mediating factor of the UTAUT theory: prior experience with EMR. Commonly accepted knowledge posits that “Many medical schools and residency programs do not currently employ or train future physicians to use EMR; training the future medical workforce to rely on EMR…can only serve to accelerate universal EMR adoption” [15]. While it may seem intuitive that prior experience would be positively correlated with use, UTAUT does not predict such a simple, positive, linear relationship. Physicians are key stakeholders in any EMR yet seem reluctant to adopt them. Our inquiry centers on whether physicians are predisposed to adopt and use an EMR because of their exposure in medical school and residency programs to such systems. Thus, with UTAUT as our theory base, this paper reports the preliminary results of a study which investigates physicians’ use of, and experiences with, EMR in medical schools and residency programs and the impact of this prior EMR experience on later practice choices.
2. Methodology

In spring 2008, a survey instrument was developed and piloted to examine the impact of physicians’ experience with EMR in Medical School, in their residency programs, and on the bearing of EMR upon their choice of future practice sites. The instrument was derived from interviews with residents and conversations with physicians as reported in a prior study [cite withheld to preserve anonymity]. We posit that prior positive experience with EMR would result in a preference for residency and practice sites that employ EMR. Two Family Practice Residency programs in the State of Idaho, both of which have adopted EMR, were surveyed. Survey subjects included both the student residents and the residency faculty; both group received the same instrument. The initial cover letter is in Appendix A. A copy of the full instrument can be obtained from the contact author.

Two survey delivery methods were used in the administration of this pilot study. The student residents’ surveys were administered to 46 residents in their weekly resident meetings. At the meeting, one of the researchers introduced the study, explained the informed consent document, and remained to collect the completed pilot instruments. The faculty surveys were also introduced and distributed to 15 faculty members during a regularly scheduled faculty meeting. In the case of the faculty, however, the survey administrator did not remain to collect the completed surveys. Rather, the faculty were given stamped, self-addressed envelopes in which to return their completed surveys to the research team.

As expected, not all residents nor all faculty were in attendance at the meetings at which the survey instruments were distributed. The strictly timed follow-up mechanisms prescribed by Dillman’s Total Design for Survey research [16] were employed for the non-attending students and for the non-responding faculty. The day the survey was presented to the subjects was day one, a reminder postcard was mailed on days 3-5, a re-mailing of the survey instrument with a cover letter reiterating the importance of the study was sent on days 11-14, and a final request was mailed on days 25-30. Copies of these three reminder mailings can be obtained from the contact author.

One hundred percent (100%) of the 15 faculty surveys were returned via U.S. Mail. Seventeen (37%) of the resident surveys, were either handed back to the researchers or returned via U.S. Mail. Fourteen of the participants were female, 18 were male, 26 were MDs, 4 were DOs, and 2 indicated they were PAs.

3. Preliminary Findings

3.1. Medical school

43.8% of the participants reported using EMR while in Medical School. When broken out between faculty and residents, only one out of the 15 faculty participants (7%) used EMR in Medical School; 13 of the 17 residents (76.5%) used EMR while in Medical School. When asked if the presence or non-presence of EMR had a bearing on their choice of residency programs, 7 of the 13 residents who used EMR in medical school (53.8%) indicated that EMR did influence their choice of residency, all indicating their preference had been for a residency with EMR.

3.2. Family practice residency programs

61.3% of the aggregate used EMR in their residency program. As the residency programs chosen for this pilot study both have adopted EMR, 100% of the resident participants in this study indicated they use EMR in their residency. In comparison, only two of the faculty used EMR while in their residency programs. Of the 19 respondents who indicated that they use, or did use, EMR in their residency programs, 11 (57.9%) report that their residency EMR was very or somewhat user friendly, 2 (10.5%) said it was neither friendly or unfriendly, and 8 (42.1%) indicated their residency EMR was somewhat or very non-user friendly.

When asked to rank their agreement with the following statement: “The part of EMR that I dislike the most is having to input the information myself,” 53.1% of the aggregate indicated that they strongly agreed or agreed that they dislike having to input their own information, 15.6% were ambivalent about it, and 31.3% answered that they disagreed or strongly disagreed. When broken out between residents and faculty, 58.8% of the residents said they strongly agreed or agreed that they dislike entering their own data, 17.6% were ambivalent, and 23.5% disagreed or strongly disagreed that they dislike entering their own information. Among the faculty, 46.7% strongly agree or agree that they dislike entering their own information, 13.3% are ambivalent, and 40% disagree or strongly disagree that they dislike entering their own data.

In a related question, “EMR would work much better for me if someone else would enter the information while I interact with the patient,” 59.4% of the aggregate indicated they strongly agreed or agreed that they would like someone else to enter the information, 15.6% indicated that they neither agreed nor disagreed, and 25% said they disagreed with this: no one strongly disagreed. When broken out between residents and faculty, 64.7% of residents strongly agreed or agreed that they would prefer someone else
enter the data, 23.5% had no preference, and 11.8% disagreed with the statement that it would be better if someone else entered the information. Among the faculty, 53.3% strongly agreed or agreed that EMR would work better for them if someone else entered the information, 6.7% had no preference, and 40% disagreed with the idea that it would be better if someone else entered the data.

Table 1. here

3.3. Choice of practice sites

When asked if the presence or non-presence of EMR had or would influence their choice of first practice sites, 12 in the aggregate (37.5%), nine of which were residents (52.9%) and 3 of which were faculty (20%), indicated that EMR did or would have a bearing on first practices sites. Eleven of these physicians said they preferred practices with EMR, one preferred a practice without EMR. Twenty of the aggregate (62.5%), 8 residents (47%) and 12 faculty (80%), indicated that EMR had, or would have, no impact on choice of first practice sites.

3.4. General computer use and skills

One might suspect that there is a connection between one’s comfort and use of computers in general, and one’s comfort and use of EMR. Thus, participants were asked to report their non-EMR computer use, and rank their skills at using these applications. Ninety-three and one-half percent of participants reported using email daily or every few days with 90.3% indicating they were very skilled or skilled with email. Seventy-five percent of participants indicated they used word processing daily or every few days and 84.4% said they were very skilled or skilled with it. In contrast to email and word processing, only 21.9% of participants said they used spreadsheets daily or every few days with 34.3% indicating they were very skilled or skilled at spreadsheets. Much more common among the participants, 93.8% indicated they do internet searches daily or every few days, and 84% feel they are very skilled or skilled at searching on the internet. Only 46.9% of participants use non-EMR databases daily or every few days with 46.9% feeling very skilled or skilled with non-EMR databases. Finally, when asked about personal use of the computer for things such as playing games, paying bills or surfing, 87.1% reported such use daily or every few days and 83.9% felt very skilled or skilled with such applications. Table 2 (Computer Use) and Table 3 (Computer Skills) present the range, mean, median, and mode for these measures.

4. Discussion

Less than half of our sample of physicians and residents used EMR while in Medical School and of the two faculty members that used EMR in medical school, one was foreign educated. However, 9 of the 15 faculty members (60%) reported experience with another EMR. We may consider extending the section regarding use of an EMR other than in Medical School or Residency to ascertain how faculty have addressed the gap in EMR knowledge and experience that they did not receive in their education and training.

Over 76% of the residents in our sample used EMR in medical school. Thus the assumption that many medical schools do not currently employ or train future physicians to use EMR does not hold true for our population. In addition, the assumption that “training the future medical workforce to rely on EMR...can only serve to accelerate universal EMR adoption” [15] is not supported. Even though over three-quarters of the residents in our study used EMR in medical school, the presence of EMR in their residency was important to only about half of them, albeit all to whom it was important indicated a preference for a residency with EMR.

Over half of our participants (53.1%) indicated that they dislike entering their own data in the EMR; nearly sixty percent of our participants (59.4%) said EMR would work better for them if someone else entered the data while they interacted with the patient. Interpreting these data is not as straight-forward as it might seem. Much of the literature discusses physician’s reluctance to adopt EMR because EMR is seen to interrupt traditional practice patterns and “intrude” on the doctor-patient interaction and relationship. On the one hand, our data may validate that EMR is a disruption to traditional practice and that it “gets between” the doctor and the patient. Having someone else enter the data would remove the physical machine from between the doctor and the patient, free the physician’s hands, and allow the physician to focus total attention upon the patient. However, many physicians who do not use EMR hold the paper chart in their hands or laps and write in it during the doctor-patient interaction, which one might argue also “gets between” the physician and the patient; why then is EMR so different?

It may be that making notes in a paper chart is very comparable to an activity that physicians are very familiar with from medical school and daily practice which is making hand written notes and reminders in lectures, rounds and patient visits. The attention this draws from the encounters is minimal and nearly
subconscious for physicians drawing little of their attention from the interaction. These notes are often made in each physician’s code words and phrases for expansion into text later at a time of dictation. However, due to the unfamiliarity and complexity of the EMR and related technology, a shift back and forth from the physician – patient interaction to an EMR – physician interaction can be more disruptive and draws energy and focus from an already complex and dynamic intellectual task.

For example, a patient reports having a normal colonoscopy on a certain date might be recorded on a paper chart: “neg c-scope 6/4/03.” Entering the same information in an EMR might include:

- Open history of present illness (HPI) component and find preventative template
- Find and select colorectal cancer (CRC) tab
- Select colonoscopy on drop-down
- Select calendar
- Select date
- Select drop down for results and select normal
- Select five-year reminder on drop down menu.

Researchers [17] have noted that many physicians find that the computer screens require too many cognitive steps. Of course, better training and familiarity with EMRs as well as continuing improvements in the application interface might reduce perceptions that EMR use is necessarily obtrusive.

Is the argument positing EMR as a physical barrier between the doctor and the patient as valid as it seems? Might a different and very simple interpretation of our findings be an illustration of physician’s frustration with user-unfriendly EMRs and their dislike of the tediousness and “clerical-ness” of data entry? Our own data indicates that most of our respondents find the EMR they are using to be user-friendly which suggests that these findings do not simply indicate physicians’ frustration with the awkwardness of the EMRs they are using.

As with EMR’s impact on choice of residency, only a small number, 12 (37.5%) of our respondents, indicated that the presence of EMR would have a bearing on their choice of future practice sites. The exact wording of the question is: “Did, or will, the availability or non-availability of EMR have any bearing in your choice of first practice site after your residency?” The residents, of course, will be choosing their first practice site in the upcoming years. However, this question asks the faculty to look back upon their careers and remember what influenced them in their choice of practices. Indeed, one might reasonably argue that as only 2 of the faculty used EMR in their residency programs, the presence or non-presence of EMR in their choice of first practice site was likely a moot point. All 17 of the residents in this study have used EMR in their residencies, yet only 9 (52.9%) say that EMR will have a bearing on their choice of first practice site: 8 indicate a preference for EMR, 1 indicated a preference for no EMR. Conversely, more than half of our participants (62.5%) said EMR would, or did, have no bearing on choice of first practice site. Again, this finding appears to dispute the conventional wisdom that “training the future medical workforce to rely on EMR…can only serve to accelerate universal EMR adoption” [15].

Lastly, this particular sample of physicians indicated that they are comfortable with technology in general and particularly with email, word processing, internet searches, and using the computer for personal reasons. They are less comfortable with spreadsheets and non-EMR databases. These findings suggest that these physicians are not technology-adverse and that they become proficient with the applications they regularly use.

6. Conclusions, limitations, and future study

TAM and UTAUT have been widely used to study physician’s intentions to adopt and use EMR. One of the mediating factors in UTAUT is experience. This preliminary work finds that though UTAUT predicts a positive relationship between experience with EMR and intention to adopt this technology, for the population in this study, that positive relationship may not exist. This somewhat unexpected finding requires further investigation in different settings and among different specialties of physicians before any conclusions can be drawn regarding the usefulness or validity of UTAUT and EMR.

Our next step in this research will be to assess the content of the open ended questions included in the instrument. These questions can be found in Appendix B.

Analysis of the answers to the additional questions will provide us with questions to identify costs and benefits related to EMR and to identify specific systems used, other venues by which physicians obtain EMR experience, and more specific questions on the choice of the first practice site.

Finally, this was a small sample of residents and residency faculty: caution must be used in generalizing our results to other physicians and other settings.
7. References


### Table 1. Data Input

<table>
<thead>
<tr>
<th>Question</th>
<th>Residents</th>
<th></th>
<th>Physicians</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
<td>Mean</td>
<td>Med</td>
</tr>
<tr>
<td>The part of EMR that I dislike the most is having to input the information myself.</td>
<td>1</td>
<td>5</td>
<td>2.3</td>
<td>2</td>
</tr>
<tr>
<td>EMR would work much better for me if someone else would enter the information while I interact with the patient.</td>
<td>1</td>
<td>4</td>
<td>2.1</td>
<td>2</td>
</tr>
</tbody>
</table>

Likert – 1=strongly agree, 5=strongly disagree. Range on input 1-5; someone else 1-4 for both groups

### Table 2. General Computer Use

<table>
<thead>
<tr>
<th>Category</th>
<th>Resident</th>
<th></th>
<th>Faculty</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
<td>Mean</td>
<td>Med</td>
</tr>
<tr>
<td>Email:</td>
<td>1</td>
<td>2</td>
<td>1.1</td>
<td>1</td>
</tr>
<tr>
<td>Word Processing:</td>
<td>1</td>
<td>5</td>
<td>1.9</td>
<td>1</td>
</tr>
<tr>
<td>Spreadsheets:</td>
<td>2</td>
<td>5</td>
<td>4.1</td>
<td>5</td>
</tr>
<tr>
<td>Searching for specific information or topics using the internet:</td>
<td>1</td>
<td>4</td>
<td>1.4</td>
<td>1</td>
</tr>
<tr>
<td>Using a non-EMR database:</td>
<td>1</td>
<td>5</td>
<td>3.1</td>
<td>3</td>
</tr>
<tr>
<td>Other time you personally spend on the computer (surfing, playing games, paying bills, other):</td>
<td>1</td>
<td>3</td>
<td>1.4</td>
<td>1</td>
</tr>
</tbody>
</table>

Minimum, maximum, mean, median and mode for Likert Scales on Use measures

1) daily use; 2) every few days; 3) at least once per week; 4) less than once per week; 5) once per month or less
Table 3. General Computer Skills

<table>
<thead>
<tr>
<th>Category</th>
<th>Resident</th>
<th>Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>Email:</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Word Processing:</td>
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<td>3</td>
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<tr>
<td>Spreadsheets:</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Searching for specific information or topics using the internet:</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Using a non-EMR database:</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Other time you personally spend on the computer (surfing, playing games, paying bills, other):</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Minimum, maximum, mean, median and mode for Likert Scales on Skill measures

1) very skilled; 2) skilled; 3) neither skilled nor non-skilled; 4) non-skilled; 5) very non-skilled
May, 2008

Dear Doctor:

We are writing today to invite you to participate in an important study of factors influencing physicians’ adoption and use of Electronic Medical Records (EMR) and Information Technology (IT). The information we collect from physicians like you is vital in our efforts to understand the complex and challenging environment of healthcare IT and medical practice. You have been chosen to participate in this study because you understand the concerns and experiences that physicians have surrounding healthcare IT.

We know you are busy and this study may seem like just one more thing to add to your busy schedule, but the 20 minutes or so you spend sharing your thoughts about EMR and IT is vital to helping us understand physicians’ concerns and use of these technologies, and perhaps to the creation, use, and the design of future EMR systems.

Please be assured that the information you provide will be treated with the utmost respect and will be held in the strictest confidence. No one associated with the residency program or your current work will have access to the data or will ever know how you answered any of the questions. Any results will be presented in aggregate: it will be impossible to identify any single participant.

If you are interested in the results of this study we will be happy to send you a summary report of the findings. Study results will be published in professional journals and presented at professional meetings; we believe it is vital that we not only acquire an understanding of physicians’ views about EMR and IT, but also that we share our knowledge with the healthcare community.

Thank you for participating in this important work.

Sincerely,
Appendix B

Open ended questions in instrument

Medical School Use of EMR
If you used EMR in your medical school, and if you can recall, what was the name of the system?
What, if anything, did you dislike the most about the EMR you used in medical school?
What, if anything, did you like best about the EMR you used in medical school?

Other than Medical School or Residency
Have you had the chance to learn EMR in any additional setting? If yes, where?
Why did or didn’t the use of EMR by your residency program impact your choice of that residency program?

Choice of Residency Program
Please list the EMR factors, if any, that had an impact on your choice of residency
   Pro: / Con:
Why would, or did, the use or non-use of EMR impact your choice of first practice site after your residency?
What, if anything, do you, or did you, dislike the most about the EMR you use in your residency?
What, if anything, do you, or did you, like the most about the EMR you use in your residency?

Choice of First Practice Site
Please list the EMR factors that will, or did, impact your choice of first practice site.
   Pro: / Con:
Please list the EMR factors that will, or did, impact your choice of first practice site.
   Pro: / Con:

Other Questions
What do you see as the assets and/or advantages to the adoption of EMR for physicians?
What do you see as the assets and/or advantages to the adoption of EMR for health organizations?
What do you see as the assets and/or advantages to the adoption of EMR for society in general?
What do you see as the drawbacks to the adoption of EMR for physicians?
What do you see as the drawbacks to the adoption of EMR for health organizations?
What do you see as the drawbacks to the adoption of EMR for society in general?