Reaction to EMR Exposure of First Year Medical Students

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Dr. Gerard Farrell led the conceptualization and design of the study. He also contributed to the interpretation of data and the drafting and revising of the article for important intellectual content.

George Klima conducted the analysis and interpretation of the data and wrote the original draft of the article. He also contributed to revising the article for important intellectual content.

Karen Murphy contributed to the conceptualization and design of the study. She also collected the data, and contributed to revising the article for important intellectual content.

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Abstract

Background

The use of Electronic Medical Records (EMRs) is being strongly encouraged in the United States and Canada by governments touting improved quality of care. While some find the technology daunting, medical students entering school today have had more exposure to technology than older members of the profession and should find it less challenging. This study assessed the technology readiness of a first year medical school class and then exposed them to an EMR.

Method

First year medical students at Memorial University were exposed to a fully functioning EMR as part of a class assignment. The assignment was based around a fabricated patient encounter and used an EMR application to create a chart. Reactions to the EMR exposure were noted during a debriefing session. Medical student reaction to the technology was assessed, including perceived ease of use and how such exposure influenced their likelihood to use an EMR in practice in the future.

Results

Results indicate that although experienced in the use of computers, first year medical students did not find the EMR easy to use and they indicated a need for formal training in the use of EMRs.

Interpretation

EMRs can be used in the medical school curriculum with introduction occurring as early as first year under controlled circumstances. Lengthy training isn't required if assignments are kept to that of a basic medical encounter. Medical students' familiarity with technology facilitates their basic use of the EMR application however, training is necessary for more comprehensive use of EMRs in practice.

Reaction to EMR Exposure of First Year Medical Students

Introduction

Despite the vigorous support of the Canadian Medical Association[1] and encouragement from the American Medical Association[2-3], Electronic Medical Record (EMR)[1] adoption in North America is currently far from universal. A broad-based survey in the USA found that only 4% of physicians reported having an extensive, fully functional electronic-records system and 13% reported having a basic system[4].

This national study reported that, among physicians who did not have access to an electronic-records system, the most commonly cited barriers to adoption were capital costs (66%), not finding a system that met their needs (54%), uncertainty about their return on the investment (50%), and concern that the system would become obsolete (44%)[4]. These perceived problems have not been formally evaluated, which adds to the uncertainty, especially among smaller practices.

Some researchers have examined the effect of introducing medical informatics topics into medical education. Their reasoning is that newly-certified physicians, especially those setting up a new practice, would have had a lifetime of exposure to information technology and would be more comfortable beginning formal practice with an EMR. Indeed, surveys of medical students show a considerable familiarity with a range of applications[5-7]. DesRoches and colleagues[4] found that physicians with fewer years of practice were more likely to be using an EMR.

However, efforts to work with clinical clerks have met with mixed results[8]. One study with third year clerks who used EMRs found they asked more history questions and ordered more clinical preventive services, arguably demonstrating that the act of filling in an EMR form improved quality of care[9].

Norman, Keane and Oppenheimer[10] attempted to run a randomized trial to compare the acceptability of PDAs *vs.* paper-based mini-CEX assessment forms among final-year medical students. The trial failed because of the students' unwillingness to use PDAs. Out of 176 students, only 4 recorded at least the minimum number of evaluations required by their program.

Despite the mixed results recorded in efforts thus far, proponents of EMR use hope that as more technologically knowledgeable groups of students enter medical school, technologies

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1   For the purposes of this discussion, an Electronic Medical Record (EMR) is defined as the electronic record keeping system used in a physician's office practice not associated with a hospital or health insurance provider. An Electronic Health Record (EHR) is the electronic record used in a hospital or insurance company to which the physician has access.

such as the EMR will be embraced. This presumes that the technology skill set of entering medical students contains transferrable skills from the web to EMRs. The objective of this study was to determine the reaction of first year students who were exposed to an EMR, including their stated likelihood of using an EMR when they begin their medical practice. Factors associated with increasing the likelihood of EMR adoption were sought.

Method

Two one-hour lectures about EMRs were scheduled for the entire cohort of first-year medical students at Memorial University of Newfoundland. Before the first lecture, students were invited to complete two surveys online: the Technology Readiness Index[11] and the Electronic Medical Record Pre-implementation Survey[12].

The first lecture introduced several topics of medical informatics, including decision support, EHRs, and data security. Students were shown how to access the Practice Solutions® EMR application but were not given any training in its use. The students were then given an assignment that involved entering data into the EMR application and performing some tasks. They were assigned usernames and passwords, as well as fabricated patients with a chart within the EMR. The students were told they were not to spend more than twenty minutes on the assignment. In the assignment, the students were given the history, physical findings and diagnosis of a case of cellulitis. They were asked to record the data and diagnosis, prescribe a specific dose of a specific antibiotic, find and fill in an off-work note (provided within the EMR) and see if any handouts on the diagnosis were available in the EMR.

At the beginning the second lecture, students were invited to give their reactions and their assessments of the EMR as a tool. The students were invited to complete the Electronic Medical Record Post-implementation Survey[12] online. This survey was developed by the authors and it asked them to respond to questions about the value of EMRs, usability, curriculum relevance, training, reactions to the specific EMR, and intention to use EMRs once they begin their practice. All questions required a response on a 5-point Likert scale.

Participants

All students from the first year medicine class in 2009 were invited to participate in the study. No demographic characteristics of the class are available, other than that 41 (64%) of the students are female. However, we can get an estimate from Kwong, Dhalla, Streiner, et al.[13], who surveyed the cohort of first year medical students at every medical school in Canada. Those outside of Ontario and Quebec reported the following composition: median 24.0 years of age, and a median self-reported family income of just over $80,000 (in 2002, the median total family income in Canada was $55,000).

Results

There were 64 students in the first year medicine class in 2009. The response rate for the two surveys completed after the first lecture was 73% (N=47). Thirty-four students completed the final survey for a response rate of 53%.

Logs of student activity were generated at the end of the assignment period which indicated that all students took part in the assignment. The students used e-mail to report issues to the lecturer. The most common problem encountered was related to logging in, either to the lab computers or to the EMR. Based on self-reporting, most students were able to complete the assignment.

Technology Readiness
As expected, these students have a positive attitude toward computer technology. A high percentage of students either agreed or strongly agreed that technology can increase control, flexibility and efficiency in their lives. The percentage of respondents who either agreed or strongly agreed to particular items in the Technology Readiness Survey are summarized in Table 1.

Table 1 Responses to Technology Readiness Index

Question	N	%
Technology gives people more control over their daily lives	28	71.8
Technology makes you more efficient in your studies	34	87.2
Technology gives you more freedom of mobility	37	94.9
You are always open to learning new and different technologies	33	91.7

We noted that these students were neither technology leaders nor followers. In response to the question "It seems your friends are learning more about the newest technologies than you are", 39% agreed or strongly agreed, 22% were neutral and 39% disagreed or strongly disagreed.

Response to the EMR

The survey administered after exposure to the assignment and the EMR asked for the students' opinions about several issues surrounding EMRs: value, usability, curriculum relevance, training, reaction to the specific EMR, and intention to use EMRs. The majority of the students who responded to the survey agreed or strongly agreed with statements about the positive value of EMRs. Respondents reported having difficulty with the software. Although the software and usage of EMRs is not typically taught at the university level, a high majority of the respondents felt that EMR training should be part of the curriculum. Respondents were also unanimous in their agreement that training and related experience

would be helpful when learning and using the EMRs. Finally, 50% of the respondents agreed or strongly agreed that they would begin their practice using an EMR. The percentage of respondents who either agreed or strongly agreed to particular items in the EMR Experience Survey are summarized in Table 2.

Table 2 Responses to Post-EMR Experience Survey

Question	N	%
Value of EMRs		
The EMR is a necessary step in health care	26	78.7
Using an EMR would improve my work as a physician	24	72.7
Using an EMR would improve the care of patients	23	69.7
EMRs are an important part of the practice of medicine	18	54.6
EMRs are an important way to decrease the likelihood of medical error in practice	16	48.5
I would like to learn more about EMRs and their capabilities	28	84.8
Usability		
I found the EMR was easy to use	4	12.1
The EMR was similar to other computer applications that I have used	2	6.1
It would have been easier to complete the assigned work using paper rather than an EMR	19	57.6
The design of the EMR needs more work	33	100.0
Curriculum Relevance and Training		
Medical students should be taught how to use EMRs as part of the curriculum	32	97.0
You find new technologies to be mentally stimulating	23	69.7
Training and Related Experience		
Training for using the EMR would have been helpful	33	100.0
I have been exposed to a working EMR before entering medical school	5	15.2
My experience using computers helped me in using the EMR	21	63.6
Knowing how to use the World Wide Web helped me in using the EMR	3	9.1
My knowledge of technology helped me in using the EMR	16	48.5

Interpretation

Analyses of the data present four issues for discussion: technology orientation of the students, need for training, perceived value and students' prior experience.

Technology orientation

According to Statistics Canada, by 1996, when the average-aged individual in this group was 11 years old and in grade 5, computer penetration had already reached 68% among top quartile of affluent households with at least one university-educated parent. Therefore,

it was expected that this group would be comfortable with information technology, capable of using it, and unfazed with its ever-changing cognitive landscape.

Indeed, respondents indicated a highly positive attitude towards technology and appear open to new advances and functionality. The Technology Readiness survey was not repeated after the lecture so we are unable to match technology orientation to students' reaction to the EMR. However, the reported comfort level with technology is encouraging.

Need for training

One hundred percent of respondents indicated a need for EMR training and most responded that they would like to learn more. Participants were asked before and after the EMR exposure if they found "new technology to be mentally stimulating". After exposure, seventy percent agreed that they did, up from 56% pre-exposure. With respect to whether the training should be prerequisite and where should such training take place, 97% of the students indicated that it should be part of the curriculum of the medical school.

Perceived value

Despite their frustration, a majority of participants believed that EMRs are an inevitable part of the future of medicine, that EMR use would make them better physicians and EMRs would improve care. However, only a slim majority agreed that EMRs were an important part of medicine or that EMRs would reduce medical error. It is difficult to reconcile the discrepancy between the students agreeing that EMRs would improve patient care and their own practice, but failing to see EMRs as an important part of medicine. In part this may reflect a dichotomy between the student expecting some form of technology to be in their office but not seeing in the technology with which they were presented that hypothetical EMR. It may also reflect the immaturity of first year students with respect to health care delivery; it is hard to see how the technology fits into a system you do not yet understand.

Prior experience

One of the intentions of this study was to consider whether Gen Y's technical skills were transferable to EMRs. Even if some do find the user interface challenging, these Gen Y students should have had enough experience with applications that the challenges should not be insurmountable and should not impact their intention to use an EMR when they begin their formal practice. However, the data refutes this expectation. Only 12% of participants found the EMR easy to use and only 6% found the EMR similar to other computer applications with which they were familiar. Furthermore, 58% of participants indicated, "It would have been easier to complete the assigned work using paper rather than an EMR". In other words, among a group who had largely abandoned handwriting years earlier[14], a majority were willing to pick up pen and paper, presumably because the EMR was sufficiently difficult or alien to them.

An understanding of the user's prior experience is one of the fundamental principles of user interface design. Thus, we suggest that the prior experience of Gen Y students has not prepared them for the current crop of EMRs. One hundred percent of participants agreed that "the design of the EMR needs work." For medical educators, this has consequence. If EMRs proliferate as has been predicted and they become an integral part of how healthcare is delivered, then educators must prepare students for their use. Since it cannot be taken for granted that Gen Y are just going to "get it" because of their extensive use of technology, educators must find a way of teaching medical information technology formally. If using a stethoscope is taught as a clinical skill, so too must be the use of an EMR.

Limitations and Future Directions

This study was designed as a pre-experimental one-shot case study which precludes drawing conclusions about associations. The study was conducted with the entire population of one class of first year medical students at one University, which limits generalizability.

Two future directions have been identified by this work. The first is that EMR design needs to simplify the user interface. If complex tasks can be accomplished using a web browser then it should be possible to interact with health information in an EMR more simply. When a population comfortable with information technology require training to use an EMR it says as much about the design of the EMR as it does about the skills of the students. In the near term, if medical educators intend to fully prepare students for practice then educators need to address the use of information technology as vital tools for collecting and using patient data. Training in the appraisal and use of technology must become a clinical skill.

Conclusions

Medical students would appreciate the opportunity to receive training in the use of EMRs as part of the medical school curriculum. This training could take place as early as first year.

The current state of EMR usability is problematic insofar as the user interface is complex and unfamiliar, even to this intelligent and accomplished cohort. Exposing students to a fully functional contemporary EMR yielded a negative reaction among the majority in a context where training was not provided. Medical students will require training prior to using EMRs as they are presently designed. Further work needs to be done on the part of EMR vendors to improve and simplify user interface.

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