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Addressing issues with EMR resulting in workarounds: An exploratory study

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Abstract

The goal of this study is to understand how the use of Electronic Medical Records (EMR) systems impacts the experience of the healthcare service provider in delivering patient care. Surveying and interviewing the hospital workers helped to answer this question and to determine the underlying factors that lead to healthcare providers' deviating from the protocol measures. Finally, specific recommendations were made in improving both healthcare providers' and patients' experience with EMR.

Keywords: Electronic Medical Records (EMR), Electronic Health Records (EHR), healthcare information systems, survey, health care providers, workarounds

1. INTRODUCTION

It is impossible to underestimate the importance of Electronic Medical Records (EMR) systems. In the past two years, 86% of all physicians' offices used EMR in some form. For the hospitals, this number is 97% (National Coordination of Health IT, 2018).

While the adoption of EMR increases, there are multiple issues with its use. Nurses, as the top category of EMR users (Sackett et al., 2006) report encountering with these issues daily: entering a patient's record, sending prescriptions, integrating the data from multiple EMRs, and such. In many cases, the inability of the nurses to perform critical operations promptly can lead to policy compliance and workarounds (Dudding, Gephart, and Carrington, 2018).

This study is the continuing step of the research by Draus et al., 2019, where the authors found the general areas of concerns related to the use of EMR. In this study, interviews were conducted with various healthcare providers as the primary users of EMR, to determine the specific areas in EMR that need improvement. According to Dudding, Gephart, and Carrington (2018), some issues in EMR, such as constant interruptions, changes in communication patterns and workflow, may lead to healthcare providers' using workarounds. Another goal of the study was to determine such issues and give recommendations on how they can be improved.

The following research questions were answered in the study:

RQ1: How does use of EMR impact the experience of the healthcare service provider in delivering patient care?

RQ2: What are the underlying factors that lead to health care providers taking off protocol (not prescribed by EMR) measures to get their job done?

RQ3: How can the issues with EMRs be addressed to make a health care service provider's experience better to improve patient outcome?

2. REVIEW OF LITERATURE

Machinery has existed and been used in hospitals in the form of life-supporting devices for quite some time. Information technology use in the medical field, however, has only recently blossomed. In the late 1990s, with the release of the American Academy of Colleges of Nursing's "The Essentials of College and University Education for Professional Nursing," the use of information technology in hospitals for informatics, the category under which Electronic Medical Records (EMR) fall, began. The core concept of this document was placing strategic value upon healthcare informatics, specifically in the nursing field. The impact was counter to its standard view as a mere resource, and in opposition of the federal funding, trend instituted four years earlier lowering the amount of money available for implementing informatics systems (Sackett, Jones, & Erdley, 2005).

There is somewhat of a debate on the definition of the term EMR. The confusion with the term is due to a similar term existing, Electronic Health Record (EHR). The EMR system is defined as a "digital version of the paper charts in the clinician's office" (Garrett & Seidman, 2011, para 5). Whereas the EMR is merely a digital version of a paper chart, the EHR builds upon this by allowing use by many different healthcare providers, such that all providers involved in a patient's care can record and share information. The list includes providers that are not Primary Care Physicians (PCP), such as sports medicine clinicians, chiropractors, etc. (Garrett & Seidman, 2011).

The Health Insurance Portability and Accountability Act was the impetus for the adoption of EMR systems (Government Publishing Office, 2018; Adler-Milstein & Jha, 2017), but despite the government mandate electronic systems offer the medical field many benefits. Friedman, Parrish, & Ross (2013) noted many benefits due to electronic systems making records available quickly and from anywhere: the ability for providers to measure disease level/distribution, report and investigate notifiable diseases, have access to complete, longitudinal patient records, and gain timely access to patient records. While these specific benefits are notable, one must be able to see the forest despite the trees. Improved efficiency, better patient care, and higher patient safety are the higher-level contributions achieved through the benefits above (Institute of Medicine, 2003).

EMR Adoption and Champions

In four years, from 2008 to 2012, it was found that EMR systems have been adopted (at a

minimal level) at a rate that rose from 9% to 44%. Although this increase in adoption seems to suggest a positive trend, it is important to note that the percentage of hospitals with only a basic EMR system is much lower than the percentage of hospitals that do not have any electronic system at all (27.3% versus 56%). In only one case do we see that the percentage of hospitals that have adopted a basic EMR system is higher (by 4.9%) than those that have no electronic system: major teaching hospitals (members of the Council of Teaching Hospitals). Although the outlook may look dire, many hospitals do use electronic systems for essential public health functions: submitting syndromic data to public health agencies, submitting data to immunization registries, and submitting lab reports to public health agencies is done by more than 50% of hospitals (DesRoches et al., 2013).

To increase adoption of electronic systems, it is essential to understand which user groups are the champions of such projects. Healthcare professionals (not administrators), such as nurses (Sackett, Erdley, & Jones, 2006) and nursing leaders (Edwards, 2012), are significant drivers of adoption by impacting their "reception, design, development, and implementation" (p. 111). There are other champions of electronic system adoption, such as PCPs, due to the electronic system's ability to help with PCP efficiency and workload productivity (Bae & Encinosa, 2016; Xierali et al., 2013). Other healthcare professionals can also drive adoption of electronic systems, such as dentists, pharmacists, physical therapists, and allied health professionals. It is crucial, however, to note that adoption is more vehemently pursued by professionals when they have a specific need for such systems; but, even so, sometimes the requirement does not outweigh the perceived negative factors of EMR implementation for some professionals (Acharya, Schroeder, Schwei, & Chyou, 2017; Fuji, Galt, Siracuse, & Christoffersen, 2011; Wang & Biedermann, 2012; Yung, 2017).

Acceptance Issues

Despite the numerous user groups with the ability to pursue the implementation of EMR systems, such systems are not always immediately accepted within the institution. The most common issues are "limited or no access to computers, fear of change, nurses too busy to use computers, and nurses don't like computers" (Sackett, Erdley, & Jones, 2006, p.251; Gesulga, Berjame, Moquiala, & Galido, 2017). The common theme with these issues is the healthcare professional's ability to use technology. A key acceptance factor that emerges is user-friendliness (Aldosari, Al-Mansour, Aldosari, & Alanazi, 2018; Sidek & Martins, 2017; Gagnon et al., 2014). Healthcare professionals' information knowledge is at a low level; education is "urgently required" (Syoubuzawa, Yamanouchi, & Takeda, 2006, p. 819), especially for those professionals 30 years of age and above. Not only should professionals be educated on the EMR systems themselves, but due to the nature of the information with which they work, it is critical to understand the ease accessing and distributing this information, which can lead to the blurring of ethical lines (Aluas, 2016). As long as healthcare professionals are adequately trained, most would recommend electronic systems over the traditional paper systems (Choi, Chung, & Lee, 2006).

EMR Deficiencies and Workarounds

Although the satisfaction of healthcare professionals is essential, patient safety is an equally critical higher-level contribution of EMR systems. Bar, Rask, & Becker (2018) found that patient safety events can be significantly decreased by implementing EMR systems produced by a single vendor. One, however, should not ignore the previously exposed implementation issues. When healthcare professionals view the electronic system as adding "new additional steps in [their] workflow" (Patterson, 2018, p. 281), they find ways to bypass such steps in order to maintain their situational awareness of their patient load, such as resorting to using non-electronic means (e.g., paper, whiteboards, etc.) (Stevenson, Israelsson, Nilsson, Petersson, & Bath, 2016). Harkening back to patient safety, such "workarounds" are typically viewed by non-healthcare professionals as a cause for concern (Halbesleben, Wakefield, & Wakefield, 2008; Meeks et al., 2014; Stutzer & Rushton, 2015). Healthcare professionals, on the other hand, merely view these workarounds as "work patterns [... created] to accomplish a crucial work goal within a system of dysfunctional work processes that prohibit the accomplishment of that goal or makes it difficult" (Morath & Turnbull, 2005, p. 52). This pattern of behavior confirms the Adaptive Structuration Theory, which states that groups will evolve the technology to fit their needs (Barrett, 2017) better. Though previously described as unfavorable, workarounds are not always such. Barrett & Stephens (2017) argue that the use of workarounds can lead to lower resistance to

using EMR systems and increased perception of their success.

Many studies had investigated the reasons for the use of the EMR system workarounds by healthcare professionals. Heavier workloads, work interruptions, and altered communication patterns were exposed as crucial motives behind the use of workarounds (Dudding, Gephart, & Carrington, 2018; Assis-Hassid, Grosz, Zimlichman, Rozenblum, & Bates, 2019; Rathert, Porter, Mittler, & Fleid-Palmer, 2019). One study suggested that more errors are made due to the drop in critical thinking skills promulgated by built-in automated processes/instructions in EMR systems (Pagulayan, Eltair, & Faber, 2018). On the other end of the spectrum, there are healthcare professionals who refuse to use EMR systems due to their suboptimal design. Instead, they hire medical scribes to shadow them throughout the day and handle the secretarial duties of entering data into the EMR system. This delegation of work to secretarial staff, too, can be viewed as a workaround (Schiff & Zucker, 2016). Others, however, have negative feelings toward EMR systems due to the belief that said systems were designed more for hospital administrators than to assist healthcare professionals in providing better patient care (Eason & Waterson, 2013). The contradiction in sentiments is related to the professional's expected versus perceived user-friendliness of the electronic system, due to the system's enforced workflow that causes users to enter data in non-intuitive ways that are vastly different than how one interacts with patients (Rathert, Porter, Mittler, & Fleid-Palmer, 2019). Although these studies do not agree on every aspect, one theme is at the heart of them all: poor EMR design.

3. DATA COLLECTION AND ANALYSIS

Semi-structured interviews were conducted on eight health care workers at two geographic locations (metro and rural) working at various sizes of hospitals (Level 1 Trauma, small regional, etc.). Audio recordings of the interviews were reviewed for themes for each interview questions by at least two separate individuals on the research team. These themes were then collated and assigned to each research question. The demographic information of the participants is provided in Appendix 1. The themes are discussed below in the results section.

4. RESULTS

RQ1: How does use of EMR impact the experience of the healthcare service provider in delivering patient care?

It is clear from the data that the impact of EMR is perceived as more negative than positive by most of our health service provider participants. Participants identified several issues with EMR that lead to frustration within the workforce providing direct care. Our data suggests five emergent themes about issues with EMR that negatively impact patient care (Table 1): Data schema does not match reality, navigation of the systems cumbersome, lack of appropriate fidelity, systems do not mirror actual workflow, and poor communications with other systems in and outside of the hospital or setting.

Respondents noted that the system allowed a lot of data redundancy, which means entering the same information multiple times in many steps. It is easy to get lost or be unable to retrieve pertinent information from the system as there are too many options available from which to choose and it does not make intuitive sense.

The organization of data flow in the systems and the schema did not quite match how information was generated and consumed by the system and providers. The second theme was the most dominant theme for this research question as practically every participant mentioned this problem. The system has multiple entry points to complete charting specific procedures and sometimes it is impossible to navigate to all the right spots. One participant observed:

> "When we do pulmonary function studies, you could have the printout from the PFT machine… That physical paper that gets printed out gets read by the doctor; he interprets it via the telephone… they dictate it [...]. That dictation goes one place in that chart, but the scanned paper that's printed from the machine with the graphs and the actual test goes in a separate place in that chart. So many people who aren't familiar with the charting system don't know where to look, and for some reason, they can't merge the two in the chart somewhere."

Final Themes		count
1-1	Data schema doesn't match reality	5
1-2	Navigation of the systems cumbersome	8
1-3	Lack of appropriate fidelity	5
1-4	Systems do not mirror actual workflow	3
1-5	Poor communication with other systems	3

Table 1. Themes about issues with EMR

The third theme, lack of appropriate fidelity, is about the system demanding too much time to get any work done. The system sometimes requires too many details, which seems unnecessary, or not enough details, which is worrisome, to complete a patient's file. As a participant shared,

> "Sometimes I'll listen to a patient [...], and they'll be so wheezy, and you know no one's been listening to them because everyone's just been charting the same damn thing because you can just click [Use Previous Values]. It happens all the time."

The fourth theme for this research question, systems do not mirror actual workflow, suggests counterintuitive systems in terms of how the process flows on the actual floor of a hospital versus how it moves on the system. The actual workflow requires certain things to be done in order to move on to other things, whereas the systems do not mirror the real sequence of events, which leads to entering similar information multiple times.

The final theme for this research question, poor communication with other systems, entails challenges due to systems within the same facility unable to communicate appropriately. The systems that need to be linked in a way that data can flow seamlessly for cost-effective patient care are more like silos that have limited asynchronous connectivity causing more harm than good for patient outcomes. As shared by a respondent:

> "The ABG machine was an hour off because of daylight savings time. So when the results crossed over, it looked like I drew the blood gases an hour later or earlier than what I actually did, which then wouldn't correlate if someone went to change that person's oxygen."

All of these themes identified from our data suggest how and why systems can cause frustration for providers, the time lag in right care, and inefficiency in workflow and compromised data quality in patient charts. These are some of the reasons that encourage "workarounds" in such settings.

RQ2: What are the underlying factors that lead to health care providers taking off protocol (not prescribed by EMR) measures to get their job done?

As discussed in the previous section, working with EMR leads to multiple issues which can demoralize service providers and encourage them to take "shortcuts" to get the job done. For research question 2, four categories of workarounds were identified (Table 2). The first category suggests that EMR issues acknowledged by providers negatively impact the service provider's attitude to patient care. The service provider's priority becomes meeting the system's requirements (which are complex) over interacting with patients directly. This shift in opinion on the part of the provider impacts patient-caregiver connection.

The second category of responses was around poor interface design of the systems leading to "workarounds," such as not scanning medications and following the right protocols. The systems are counterintuitive and repetitive and many times slow in providing timely help to the patient. Scanning medications is an area where workarounds due to bad design is standard. As shared by a participant:

> "A medication I administer a lot is called Duoneb. So say I'm out of Duoneb but I have an Albuterol and I have an Atrovent, you know, put those two together, and it makes Duoneb. You're able to press this little ID code button and say 'unable to scan' and administer whatever medication that you want to. In the past, we've had to let go nurses because they said that they were giving certain medications that they weren't."

Final Themes		Count
2-1	System negatively impacts service provider's attitude to care	3
2-2	Poor interface design	6
2-3	System demands/charting slows down patient care	6
2-4	System for liability purposes more than patient care	4

Table 2. Categories of Workarounds

The third category of factors leading to workarounds is about system demands on the service providers, which slows down actual patient care. The functional requirements of systems in terms of detailed charting and multiple entries of similar things leads to situations where actual values of vitals are noted down and charting is performed after the shift. The delay in recording the data and charting leads to less accurate data entry, less time to spend with patients, and being less confident about being able to meet all demands to get the job done.
As shared by a respondent:

> I write down the vitals so that I can get it in when I have time. Hours after writing it down, when I get to charting in the systems, I should be able to read my handwriting and guess the right time of the day when I noted these numbers! How else am I going to get through the shift?

The last category in this section is about perceiving systems and charting more as a liability reduction tool than improving patient care vector. Service providers are mandated to follow system requirements and providers strictly are discouraged from using their judgment to document patient data. As shared by a service provider:

> Has the patient changed position? Okay, my patient is sedated and knocked out straight for three days. They are not in moving position. But you can't keep pulling your information from the previous assessment! But nothing has changed! It is a very big circle of keep doing exactly the same thing. It's redundant. More for liability than care.

The motivations for "workarounds" in healthcare settings is mostly providers trying to do the right thing at the right time, even if it requires cutting corners to get the job done. The EMR system is perceived as a useful tool in service delivery, but it exists more to protect an organization's liability exposure and less to improve care for the patient.

RQ3: How can the issues with EMRs be addressed to make a health care service provider's experience better to improve patient outcome?

Our data suggested three things to improve healthcare service providers' experience with EMRs (Table 3). The first suggestion is to develop a universal platform for EMRs such that no matter which organization they work with, they are familiar with the interfaces and know precisely where to find any piece of information. They spend years learning one system, and with a quick change of system or a job they have to relearn everything completely. A respondent shared her experience about shifting from one EMR to another:

> "It was kind of a nightmare for a couple of weeks. They cleared out the hospital to make sure that it would go easier. They sent patients home or to other hospitals."

The second suggestion is around improving charting experience. Data suggests that it is frustrating to efficiently chart and provide excellent patient care at the same time. Service providers typically do charting later after they have engaged with the patient or after the shift is over. Most EMRs have dense menus, redundant information requirements, and lack of clarity in effectively navigating the system to make the right decision at the right time for service providers. As shared by a respondent:

> "I've noticed the older nurses, like; they'll stay after work for two hours to chart. Sometimes they get paid, sometimes they don't. And you never, ever, ever see a young nurse do that. [...] Two hours… I was so pissed when I found out they get paid. That's overtime!"

Improvements in system	Count
Develop a universal platform for EMR	6
Make charting more convenient	10
Develop system interoperability	5

Table 3. Suggested Improvements in EMR

The final theme for this research question is to develop system interpretability to be able to acquire real benefits of EMR systems. It is helpful when service providers can pull patient records at different functional units for the same organization. As shared by a respondent:

> "When my dad had his episode with his seizures, we went to three different facilities, and you know what, they were actually all [within the same health system]. I know at least two of them had Epic, I don't know if [the third] does so I can't answer that. Every single facility we went to asked my dad what happened. And I get it; they want to hear the story from him. But some of them didn't even know he had a history of seizures where he had been seizing for 10-15 years, so that was frustrating."

Our participants agreed that EMR is a good thing. EMR makes service providers accountable for their actions and provides continuity of care to patients. However, it is crucial that the experience of using EMR is more positive than negative for service providers. Negative experiences with poorly designed system interfaces lead to workarounds in healthcare settings.

5. DISCUSSIONS

In the sociotechnical framework of information systems, our results indicate that all problems in using EMR are primarily in the technical sphere of the context and are systemic. EMR is a tool created for health service providers to make better patient care available. The EMR system, however, is disappointing in the apparent intent (more liability oriented), in its design, in its inability to follow the actual workflow, and in lack of support for seamless flow of data creating frustration for users of this systems. These kinds of frustrations lead to "workarounds," which are, for the most part, service providers' trying to do the right thing at the right time for the patient. As one of the participants observed:

> "A doctor will put in for a triple dose; pharmacy sees it and says, 'I don't recommend that.' So I call down to the pharmacy and say, 'This patient cannot breathe. They're chugging away at a respiratory rate of 40/min. I need this dose approved so I can document it.' In reality, I've already started that treatment because I know it's an effective dose, and I have an order from the doctor."

It is essential that these problems are addressed and we have systems that have a universal platform and interoperability to support continuity of care. Charting is critical to provide an excellent patient outcome and the current cumbersome and confusing charting is detrimental to patient care. As shared by a participant:

> "For every single breathing treatment that I give, I have to put a code [...], and it charges the patient for one breathing treatment. So say I'm seeing 30 patients… I have to charge for oxygen; I have to charge for every time I put a pulse-ox on their finger… nothing is automatically charged. It all relies on humans. Think about it; humans make mistakes. [...] The number of times that they order nebs in the ER, maybe once every couple months… they give them daily, and they should be charging for every single one. Think about all of the money that's missed."

Additional insight into the usage of EMR in this study is about extra challenges in using such systems by a relatively older population of healthcare service providers. This segment of users have less confidence in the use of technology and take more time than younger employees, which leads to increased anxiety and more chances of errors in the systems. All participants agreed that older workers find the system more challenging, feel frustrated in asking the same questions many times, and stay back longer to complete their regular shift work on the system. As a participant shared:

> "I have known people who have quit over the implementation of the computer system that we have. They would rather leave their job than have to have learned that new system."

Our results provide several recommendations for practitioners in this field:

- Enable health care service providers on the floor of hospitals by providing a powerful tool such as EMR that aids them in doing their work and not hinder the day-to-day work. (Themes 1-2, 1-4, 2-1, 2-2, 2-3, 2-4)
- Allow a realistic amount of time for system usage purposes per shift to health care workers so that the focus on

the quality of care is not diluted in the process of using the system. (Theme 1-3, 2-1)
- Create a universal platform that helps retrieval or data input effortlessly and service providers could use it from anywhere. (Theme 1-5, 2-1, 2-3)
- Periodically revisit protocols and procedures around the usage of EMR. Assess if the system mirrors the workflow and assists the provider, not take them away from the patient's bedside. (Themes 1-1, 1-4, 2-1, 2-2, 2-3, 2-4)

If the system makes service providers stay for extra hours rather than leave after their shifts are over to complete charting, it will eventually not result in good patient outcomes. There should be real-time provision for charting in any service provider's shift. Overall, the technical issues with EMR could be fixed, the vision of having "one record per person" in universal EMR is possible, and it could eventually bring the total cost of healthcare down in the country.

6. CONCLUSION

This study has implications for theory and practice in the healthcare field. The results of this study identify issues with EMR leading to workarounds in healthcare settings daily. The results in this study support and significantly contribute to the body of knowledge in EMR and workaround research, adding much more workaround detail than previous studies, and it can inform many more studies to refine the understanding of these issues further. Practitioners, such as healthcare administrators, could use these results in their settings to further refine the protocol of EMR usage. EMR vendors could use the results to improve their products that are being used in the industry.

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APPENDIX 1

Participants' Demographic Information

Participants	**Job description, age, years of experience**	**Primary shift, employment status, gender**
Participant 1	Assistant at detox unit, 31 years 4 years	Evenings 3-11, Full time, Female
Participant 2	Nursing assistant, 21 years, 3 years	day shifts, part time, female
Participant 3	patient care technician, 21 years, 3 years	both day and night shifts, casual, Male
Participant 4	patient care technician, 20-30 range, 2 years	Day shift, casual, Female
Participant 5	Respiratory Therapist, 23 years old, 3 years	Night shift, Full time, Female
Participant 6	Respiratory Therapist, 23 years old, 3 years	Day shift, Full time, Female
Participant 7	Respiratory Therapist, 32 years old 12 years	Day shift, Full time, Female
Participant 8	Respiratory Therapist, 26 years old 4 years	Day shift, Full time, Male