

NURSES' PERCEPTION OF THE IMPACT OF EMR ON THEIR PROFESSIONAL ROLE IN THE "CULTURE OF SAFETY"

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ABSTRACT

The use of Electronic Medical Records (EMR) is now a requirement in virtually every nurses' everyday work, and as shown in many studies, the nurses are becoming accepting of this fact. Most nurses are very well trained in using the electronic records, and admit the fact that EMR makes the process of managing health records simpler, more reliable and more efficient. However, many nurses admit that there are situations that make it difficult to follow the EMR protocol, and that possible "workarounds" exist that can be used in such situations. The goal of our research is to study what workarounds are used, and to what degree the nurses find them acceptable.

Keywords: Electronic Medical Records, EMR, Culture of Safety

INTRODUCTION AND LITERATURE REVIEW

Electronic Medical Records (EMR), or Electronic Medical Record Systems are defined as "an electronic record of health-related information on an individual that can be created, gathered, managed, and consulted by authorized clinicians and staff within one health care organization" (Health Information Technology). The term EMR is very often used interchangeably with Electronic Health Records (EHR), having a similar definition in literature, but with a broader scope. While EMR were historically considered as the records limited to one practice, EHR are more inclusive and can be shared among practices and hospitals (Garrett and Seidman, 2011). In this study we, although using the term EMR, assume any type of an electronic medical or health record system with any scope.

The use of Electronic Medical Records increased dramatically over the past decade; beginning in 2008 the adoption rate of EMR grew from 9% to 44% during the following four years (DesRoches et al., 2012). EMR have a long history that started more than two decades ago. In the following literature review, we answer the questions that determine our interest in EMR and the research questions posed in this paper.

The term EMR has a history of over 20 years, evolving from Healthcare Informatics and Nursing Informatics. The definition of Nursing Informatics emerged in 1996, derived from the general field of Healthcare Informatics, defined as any information system used in healthcare (Sackett, Erdley, and Jones, 2005). In the 21st century, according to Sackett et al., the paradigm shifted from the Nursing Science to Healthcare science, where the gap increased between the proposed policies or requirements and the real world. The use of EMR in the US hospitals is now ubiquitous. According to the last year report from the National Coordinator for Health Information Technology (2016), over 95% of all eligible and critical access hospitals participated in the Centers for Medicare & Medicaid Services (CMS) Electronic Health Record (EHR) Incentive Programs. In the course of the program, the participating organizations were encouraged to use EHR to manage the patients' records. As a result of this participation, the hospitals demonstrated meaningful use of certified health IT. According to the same source, more than 60% of physicians provide their patients access to the electronic health records, enabling them to communicate with their physicians' offices and view their health records online.

Judging by the fact that EMR are now accepted in 95% of the hospitals, their benefits must outnumber the potential threats. There are many debates on whether using EMR reduces the safety threats or adds new ones. Most researchers agree that introducing EMR benefits greatly the health care system. EMR have a possibility to reduce the number of medical errors and therefore increase the safety of the patients (Institute of Medicine, 2003; Friedman, Parrish, and

Ross, 2013). Some authors argue that the evidence of this happening is fairly low (Bae, Rask, and Becker, 2018), while the others received the data that show statistically significant improvements in clinical documentation handling. For example, Seto, Inoue, and Tsumura (2014) conducted a study to analyze the data before and after EMR were introduced in an outpatient workflow. As a result, they found, among other facts, an increase of 89.2% in the number of hours for patient care and a 78.8% reduction of the time the nurses handled medical records. Many of such studies were conducted in limited settings, mostly in one hospital, and are not generalizable (such as Seto et al, 2018 or Aldosari, Al-Mansour, Aldosari, and Alanazi, 2018).

Who are the primary users of EMR?

Many groups of health care workers are involved in the process of adopting EMR; however, registered nurses have the most potential to drive this adoption (Sackett, Erdley, and Jones, 2006). In addition, the nursing leadership plays an important role in organizing the management of EMR and making efficient protocols for their use (Edwards, 2012). In most programs, nursing students are being taught EMR usage and using EMR's in simulations while in school.

Acceptance Issues with EMRs

In early 2000, when the implementation of EMR in healthcare was still at the introductory stage in many hospitals, they caused unacceptance among many nurses. The majority of reasons related to simply the unacceptance of new technologies: "limited or no access to computers, fear of change, nurses too busy to use computers, and nurses don't like computers" (Sackett et al., 2006, p. 251). After a decade, the fear of new technology is no longer an issue; EMR became part of the nurses' every day work. The lack of familiarity with technology was replaced by other complication, such as information misuse (Aluas, 2016), late entries or altering the information in EMRs (ED Legal Letter, 2018). An important factor in the level of acceptance of EMR by nurses is the perceived usefulness and ease of use. (Aldosari et. al, 2018). We are interested in how nurses balance between the perceived usefulness and necessity of EMR and their immediate responsibilities.

Workarounds

Healthcare professionals including nurses are using EMR in ways that are not intended (Patterson, 2018). Some of the reasons cited for this behavior were "due to interruptions, heavier workload due to the electronic health record, changes to the workflow, and altered communication patterns" (Dudding, Gephart, and Barrington, 2018). Interestingly there is some evidence that using workarounds or using the system in ways it was not designed to be used, actually increased the users perceived usefulness of the system (Barrent, 2018) There has been some research into the use of workarounds in different nurse specialties (Dudding et. al, 2018).

What is the meaning of "Safety Culture" and how does it impact EMR management?

In this study we understand EMR management as the set of procedures and regulations that a healthcare organization follows during the use of electronic medical or health records and the system where they are stored. The EMR management (as well as many other activities) is at present dictated with the safety culture in the health care. Patient safety is generally understood as "the reduction of unnecessary damage risk during health care to a minimum acceptable" (Kareny da Silva et al, 2016), and the safety culture is the culture aimed at the patient safety. Ever since EMR gained wide acceptance in healthcare, the phenomenon of the "Safety Culture" was introduced in numerous studies as the researchers attempted to determine the impact of EMR on the safety of patients. According to several researchers, such as McGuire et al (2012), the majority of healthcare workers perceived that introducing EMR increased their ability to provide safe patient care.

There are no perfectly secure EMR; no matter how strong the system is, there will always be external and internal threats. The external threats, including hacking, attacks, intentional compromising/stealing information, and other are widely discussed in literature, but they are not the subject of this research. The internal threats often include the workarounds that the personnel uses to avoid the protocol for various reasons. In all organizations, the employee negligence and failure to comply with security policies poses a serious threat to the safety culture (Sipponen and Vance, 2010). The situation may be slightly different in healthcare, because the patient's safety is the top priority and some non-compliances may be justified. In some cases, there may be no time or resources to follow the EMR protocol. The importance of the nurses' teamwork to the safety culture was underlined in many studies (such as Tobias, Bezerra, de Brito Paranaçuá, and de Camargo Silva, 2016; de Carvalho Barbosa Cavalcante et al., 2016). Although in general the nurses do believe that the patients safety is the priority (Tobias et al., 2016), it is very important to know whether

and when the nurses as a team have similar views on following or not following the EMR protocol. Very few studies report the nurses' justification on violating the protocol in certain specific situations.

The literature review lead us to develop the following four research questions.

RQ1. What are the differences in the perceptions for in-service and pre-service nurses in relation to perception about the use of EMR and related technologies and its impact on the balance between efficiency and patient care?

RQ2. Do nurses who say they have used or witnesses nurses using "workarounds" have different perceptions about the use of EMR and related technologies and its impact on the balance between efficiency and patient care?

RQ3. Do nurses with differing levels of education have different perceptions about the use of EMR and related technologies and its impact on the balance between efficiency and patient care?

RQ4. Do nurses in different areas of nursing have different perceptions about the use of EMR and related technologies and its impact on the balance between efficiency and patient care?

DATA COLLECTION

Instrument

A survey instrument was developed that focused on the nurses' perception of the use of the EMR and the culture of their workplace in relation to the EMR. Data was collected from pre-service and in-service nurses using a 5 point Likert Type scale from "Strongly Agree" through "Strongly Disagree" so lower values equate with agreement and higher values equate with disagreement.

Sample

While 88 subjects started the survey, the majority of questions on the EMR were completed by only 77 or 78 subjects. Most of the subjects (88.6%) were between 20 and 30 years of age and 10.3% were 50 years old or older. Almost 74% of the sample had less than 1 year of nursing experience. This was to be expected, as pre-service nurses were included in the sample for the survey. 11.3% of the sample had more than 5 years nursing experience. Educational experience ranged from a High School diploma (19.3%), Associates degree (13.6) and a Bachelor's degree (66%) with only one subject having a master's degree. It should be noted that the data was collected in a state that does not require a Bachelor's degree for entry into the profession.

FINDINGS

RQ1

What are the differences in the perceptions for in-service and pre-service nurses in relation to perception about the use of EMR and related technologies and its impact on the balance between efficiency and patient care?

Overall the pre-service nurse's mean values for the questions mirrored the results of the in service nurses. The in-service nurses had two questions with very low mean scores in the "agree" range.

The first question, "I have, or I know someone who has worked around procedures because it just made the job easier" had a mean score of 1.68 for the pre-service nurses. This indicates that the subjects agreed with this statement. Clearly, the use of workarounds is part of their work environment.

The second question with a high level of agreement was, "There are many distractions such as lack of knowledge, short staffing and fatigue can lead to medication errors." The mean score of the answers to this question was 1.71. Again, this is a question relating to the environment and culture of the work place and not about the use of the EMR or the EMR itself.

After running T-Tests between the in-service and pre-service nurses four questions had significant differences. As shown in Table 1.

Table 1. Questions with Significant Differences between Preservice and In Service Nurses

Question	P Value	Means
There are too many alarms in every system that actually impede me from doing my work.	.044	Pre=3.28 In=3.42
There are many distractions such as lack of knowledge, short staffing and fatigue that can lead to medication errors.	.024	Pre=2.21 In=1.94
There is a time lag in transferring information between systems requiring actions for patient care that do not match up.	.017	Pre=2.86 In=2.92
There are situations where the patients have not been entered into the electronic record systems but need care.	.035	Pre=2.86 In=2.56

RQ2

Do nurses who say they have used or witnessed other nurses using “workarounds” have different perceptions about the use of EMR and related technologies and its impact on the balance between efficiency and patient care?

One of the Likert type questions asked the subjects about using or witnessing the use of “workarounds” in their work environment. This question was collapsed from 5 groups into three. The subjects who responded “Strongly Agree” or “Agree” were merged in the new category named “Used Workaround” (N=31). The subjects who answered “Strongly Disagree” or “Disagree” were merged in the new category named “Don’t Use” (N=21). The “Neutral” (N=24) category was not changed. This resulted in three groups; one that had agreed to witnessing workarounds, one that had disagreed with witnessing workarounds and one that had answered “neutral” to that question.

An ANOVA was performed using this new collapsed variable as a factor against the rest of the Likert Type questions. Six questions had significant differences between the groups. A further Tukey analysis of those five questions revealed which groups were different. The results are shown in Table 2.

Table 2. Differences between Nurses Who Reported Witnessing the Use of Workarounds

Question	P Value	Groups that Differed
Risky behavior is chosen in life threatening situations where there is not enough time to follow the procedures.	.002	“Used workaround” and “Neutral” “Used workaround” and “Don’t use”
Organization does not care about my work load and how hard it makes my job if I follow every safety procedure.001	Used workaround” and “Don’t use” “Neutral” and “Don’t use”
There are many distractions such as lack of knowledge, short staffing and fatigue can lead to medication errors.	.001	“Used workaround” and “Neutral”
There are situations where the patients have not been entered into the electronic record systems but needs care.	.006	“Used workaround” and “Neutral” “Used workaround” and “Don’t use”
Delays in verification from pharmacies for prescribed medications leads to administration of drugs without verification.	.033	“Used workaround” and “Don’t use”
There is conflict of interest between hospital management and staff. Management wants to create culture of safety but save money too, and down-staffs frequently leading to unsafe environment and workarounds.	.024	“Used workaround” and “Neutral”

All of the differences were between the groups that had used workarounds. In two of the six questions only differences were between the groups that used the workarounds and the group that reported being “neutral”. Both of those were environment type questions dealing with distractions and management. Three of the questions had differences between the “used workarounds” group and both other groups. Those questions dealt with patient safety and care. The final question with differences between the “Used workarounds” group and only the “Don’t use” group. That question dealt with delays in the pharmacy.

Somewhat surprisingly the Spearman correlation (-.197) between the five level question on using or witnessing workarounds has a very low correlation with a nurses years of service. The subjects' education level, addressed in RQ3, has an even lower Spearman value of .012.

RQ3

Do nurses with differing levels of education have different perceptions about the use of EMR and related technologies and its impact on the balance between efficiency and patient care?

An ANOVA was performed using the subject's education level as the factor. The single master's level subject was dropped for this analysis. No significant differences between the subjects' answers to the Likert Type questions were found.

RQ 4

Do nurses in different areas of nursing have different perceptions about the use of EMR and related technologies and its impact on the balance between efficiency and patient care?

The nurse's specialty areas were coded into three broad categories; Clinical (N=30), Non-Clinical=12) and Ancillary Support (N=5).

A one-way ANOVA was computed for each of the questions in the survey using this area of nursing as the factor. One question showed a significant (p=.037) difference in the groups. A Tukey test was performed and the results showed that the clinical nurses had a significant difference from the other two groups. The question is shown below.

“Risky behavior is chosen in life threatening situations where there is not enough time to follow the procedures.”

The means for the groups, shown in Table 3, indicate that the clinical nurses having the lowest mean which indicates stronger agreement with the statement.

Table 3. Means and N for “Risky behavior” question by Nurse Specialty Area

Area	Mean	N
Non-Clinical	2.42	12
Ancillary	3.33	5
Clinical	2.22	30
Pre-Service/no answer	2.71	75
Total	2.53	122

DISCUSSION

There was no evidence that a nurse's education level has any relation to his or her views on the use of EMR or the culture in their workplace. This conclusion is supported by the results comparing pre-service to in-service nurses. There were some minor statistically significant differences in the perception of the pre- and in-service nurses, but the value of these differences were low (less than 0.3/5, or 6%). One possible way to explain this, the expectations of the pre-service nurses are very close to the reality encountered by the in-service nurses. While there were differences in four of the questions, the mean differences were very small, and the questions had more to do with the use of EMR than the environment of its use.

As we expected, the number of nurses who used “workarounds” with EMR or were familiar with the situation when someone else used them, was very low. Most nurses who answered this question positively admitted that is was necessary for the patients' safety.

The nurses with different levels of education do not have significant differences in their perception of EMR; however, there was a small but significant difference among the groups of subjects from different areas of nursing.

There is some evidence to support the view that clinical nurses have a conflict with EMR when it comes to patient safety and using “risky behavior.” This use of “Risky Behavior” shows up the use of workaround section of the results as well. There were clear differences between those nurses who had used workarounds and those that had not. These differences were most pronounced in the areas of patient care/safety and the environment the nurses were operating in to provide care.

CONCLUSION

EMR are increasingly being used in healthcare settings and have impacted the working environment of nurses. The nurses respect the policies and procedures related to EMR are very unlikely to violate the protocols of their use. The only situation what some of them might consider such “workarounds” possible is when the patient’s safety is a concern. While few nurses are reporting the use of workarounds and “risky behavior”, they admit it is done in their quest to provide patient care as technology impacts their work setting. Future study should focus on the use of these workarounds and why they are needed.

The most important limitation to this study is the small sample of nurses. Increasing the sample may result in a more accurate data and a more reliable analysis. We may need to rethink the questions and remove the ones that generated predictable and consensual responses. The remaining questions need to be drilled down, giving us the opportunity to look at certain areas in more detail.

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