An Investigation of Nurses' Perceptions of the Usefulness and Easiness of Using Electronic Medical Records in Saudi Arabia: A Technology Acceptance Model

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Abstract. Electronic medical records (EMRs) are essential for preserving clinical data. Nursing is one of the most influential groups of healthcare workers that adopt EHRs. It is crucial that nurses accept the EMR system for implementation to be successful. This study aims to measure nurses' perceptions of utilizing EMRs in clinical practice and identify factors affecting nurses' acceptance of EMR documentation in clinical practice to p of nurses' perspectives on EMRs to promote the adoption and deployment of EMRs in other Saudi Arabian health facilities. In this study, nurses from various hospitals were involved. According to the study's findings, perceived usefulness and usability are closely related, resulting in nurses' acceptance of EMRs. According to the survey, nurses are willing to utilize electronic medical records. In general, we found that nurses are satisfied with the EMR, with 40.9% agreeing and 24.4% highly agreeing that it is helpful for their duties. On the other hand, 9.4% of respondents agreed, and 24 strongly agreed, that the overall difficulty of the task was low. Students and professionals in nursing need to recognize the importance of EMRs in ensuring the delivery of high-quality, efficient, and effective care to their patients. Nurses must continuously update their computer skills to stay abreast of technological advancements.

Keywords: EMR; acceptance; usefulness; HIT; clinical documentation.

1. Introduction

Governments and supporters of healthcare reform have long advocated the use of health information technology (HIT) extensively to improve patient safety, increase healthcare quality, and reduce healthcare costs, including electronic medical records (EMRs) and computerized physician order entry (CPOE) [1-8]. IT and domain-specific information systems (IS) have proved useful for improving access and quality of medical information, streamlining and safeguarding medical procedures, and overcoming distance and budgetary constraints. Information technology (IT) is generally considered to be a tool for improving the efficiency and effectiveness of organizations. While medical facilities have been slower to adopt IT than other businesses, they are beginning to realize its advantages [9]. EMRs are advantageous to healthcare administrators in a number of ways, including cost reduction and quality improvement [10]. EHRs are computer programs that transmit medical treatment orders, patient histories, and diagnostic test results to healthcare providers [11].

An increasing body of research has been conducted on the acceptance and use of IT in healthcare and technological advancements [12]. Several recent studies have examined how cognitive beliefs and effects influence healthcare professionals' acceptance of electronic medical records (EMRs) and electronic health records (EHRs)[13,14]. Despite widespread encouragement and interest from governments and corporations, hospitals and physicians are still required to adopt electronic documentation [15,16]. Nurses make up the majority of the workforce in the healthcare industry. Understanding how individuals perceive technology is critical to determining its effectiveness.

This study examines nurses' perceptions of EMR systems in four Saudi Arabian hospitals. This study will provide recommendations for improving EMR practice usage. In this study, we will address the following primary research questions:

1- How do nurses perceive the usefulness of EMRs?
2- How do nurses perceive EMR systems in terms of ease of use?

Survey responses will be used to determine perceptions using the technology acceptance model (TAM).

2. Hypothesis Development

Medical errors increase if medical records, diagnoses, and medications are lost [17]. EMRs, medical informatics, and electronic health records (EHRs) are among the healthcare information technologies that facilitate user interaction and contribute to healthcare improvement [18]. Although electronic medical records are widely used in hospitals, health professionals worldwide have not yet adopted them [19]. Staff acceptance of electronic health records has been questioned despite the considerable effort put into their implementation [20]. The researcher hypothesized that Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) are positively correlated H1, Perceived Usefulness (PU) will positively influence the Perceived Ease of Use (PEOU) of EMRs H2, and no influence between Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) H3.

The willingness of health care providers to adopt electronic systems plays a pivotal role in their success [21]. Several studies have recently sought to understand how users accept technology in this manner, and these studies will be beneficial to both technology designers and implementers [17, 22-24]. It is imperative to determine whether nurses accept electronic health records since they interact directly with these records. Several nurse observation and interview sessions were conducted at multiple sites to determine how nurses utilize electronic health records (EHRs) daily [25].

Communication is improved, medication is safer, and information can be shared more easily with EHRs. It has become standard practice for nurses to use EMRs as part of their daily routines at many nursing institutions, including those where we conduct research [26]. Nurses would only accept EMRs if they were practical and easy to use, so they may have a negative view of the technology, which prevents them from learning new functions [27]. Therefore, it is essential to investigate whether EHRs are accepted in a utilization environment.

Technology acceptance has been the subject of several theories. This study was conducted in accordance with the technology acceptance model (TAM) (Figure 1 [10]).

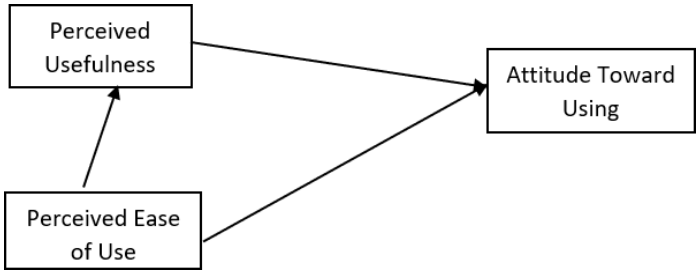

Figure 1: TAM Model (Davis, 1986)

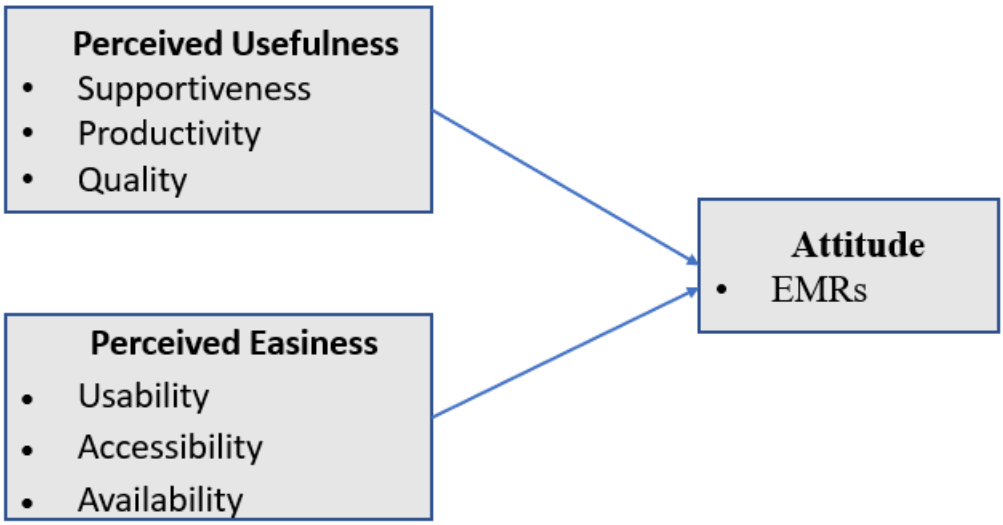

Figure 2. Source: Developed by the author based on literature review (2023)

H1: Perceived Ease of Use (PEOU) will positively influence the Perceived Usefulness (PU) of EMRs
H2: Perceived Usefulness (PU) will positively influence the Perceived Ease of Use (PEOU) of EMRs
H3: No influence between Perceived Ease of Use (PEOU) and Perceived Usefulness (PU)

Our research used it to assess the acceptance of information systems and technology. It has been examined how nurses accept EHRs using this model. Initially, it focused on why individuals might need to utilize IT more effectively [28]. Many computer systems and individuals can benefit from this technology, which is widely used in the healthcare [29-33, 33-35]. According to TAM theories, individuals' willingness to accept technology is determined primarily by perceived usefulness (PU) and perceived ease of use (PEOU) [17]. Acceptance refers to a person's willingness to fulfill a particular task's requirements. According to PU, applying specific technology will enhance the performance of a given job. A PEOU is an individual who believes that they can use a particular technology seamlessly and effortlessly. According to Davis, the way technology is used depends on the PU and PEOU. According to a literature review, few studies have examined nurses' perceptions of the usefulness and ease of use of EHRs [23].

Several studies have also used TAMs as theoretical frameworks, such as the present study, while others have conducted comprehensive validations and tests in addition to the present study. The literature indicates that there is a great deal of variation. Using a non-EMR application, Dharmarajan and Gangadharan examined nurses' acceptance of computer-generated nursing care plans [46]. In the literature, nurses working in intensive care units have been found to use different assessment tools [22]. An extended version of TAM was used in another study to evaluate physicians and nurses [47]. Several studies have been published in the literature assessing and predicting different entities, particularly emphasizing physicians' acceptance in healthcare. Since nurses are the backbone of healthcare organizations, it was considered important to investigate nurses' acceptance of EHRs. Saudi stakeholders involved in health informatics can use the current study as a baseline reference. As part of this study, nurses' perceptions of the usefulness and ease of using EMRs were examined using TAM. As mentioned above, the researcher hypothesized that Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) are positively correlated.

3. Research Methodology

3.1 *Study Area and Subjects*

A study was conducted in four Saudi Arabian hospitals in 2022. Data were collected from nurses in four hospitals in Saudi Arabia. Therefore, the target population included all nurses in these hospitals. One thousand to twelve hundred staff nurses use HIS. It is estimated that there are between 1400- 1200 users in the system. For this study, a sample size of 350 was used, and a simple random sampling method was utilized [48].

3.2 Study Design

A cross-sectional descriptive-analytic study, this study uses distributed questionnaires for data collection. An earlier survey of Tubaishat provided the basis for this questionnaire [49]. In this study, the purpose was to investigate the factors that influence nurses' acceptance of the EMR system, including the perceived ease of use and usefulness of the system.

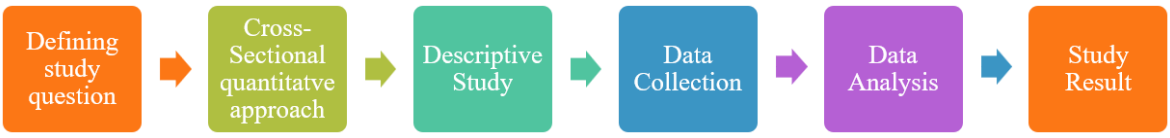

Figure 3: Research Study Approach

3.3 Sample Size

Nurses make up 1400-1200 of the total staff in these four hospitals that use HIS. It is estimated that there are between 1400 and 1200 users. Based on Krejcie & Morgan, 350 people would be an adequate sample size [48].

3.4 Data Collection, Instruments, and Measurements

The questionnaire was selected in accordance with the study's objectives and criteria. An EMR acceptance questionnaire was developed based on a study by Tubaishat [49]. The questionnaire consisted of two sections and was based on two variables. It was ensured that the statements were accurate by the researcher.

Table 1 shows the focus of our first section on nurses and hospitals. The second section of the study uses 28 items to measure both PU and PEOU (14 items for each construct). A 5-point Likert scale was used to record responses to the statements. Scales range from (1) strongly disagree to (5) strongly agree. Each item on each subscale was added up to determine the total score. As a result, a mean score was calculated. Positive outcomes for PU and PEOU increased as the mean score increased. According to the study, the reliability of the PU subscale was 0.97, and the reliability of the PEOU subscale was 0.91 [28]. The Cronbach's alpha in the present study was 0.849 for PU and 0.868for PEOU. Furthermore, we have chosen the 5-point Likert scale as the measurement scale for the model's variables.

3.5 Statistical analysis

The data were analyzed using SPSS version 17. On the questionnaire, all negative items were reverse-coded. All sample attributes and questionnaire items were calculated using descriptive statistics. We examined the relationship between the tool's usefulness and ease of use using Pearson's correlation coefficient.

4. Result and discussion

4.1. The Descriptive Analysis of Participants' Demographic and Work Characteristics

We have received a total of 357 responses. The following are the distributions:

There were 51.8 % percent female respondents, primarily between the ages of 20 and 39 (48.6), and most held diplomas (53.7%). Most of the study participants (49%) had less than five years of nursing experience, and lest (49.2%) had worked in the hospital between one and five years. Our results show that most respondents (64.8%) are average at using computers. Furthermore, 13.3% of respondents claim to have low computer skills. Researchers found that computer knowledge and experience were not associated with perceived satisfaction with EMRs, implementation difficulties, adequate training, or future usage [50]. Additionally, an investigation revealed that nurses with formal training in medical informatics have significantly higher attitudes toward computer skills [51]. Please refer to Table 1 for more information.

Table 1. Participants' Demographic and Work Characteristics

Characteristics	N (N=357)	%
Gender		
Female	188	51.8
Male	171	47.1
Age (years)		
20-29	104	29.7
30-39	168	48.6
40-49	43	12.3
50-59	34	9.7
Education level		

Characteristics	N (N=357)	%
Diploma	42	12.9
Bachelor	184	11.7
Master/PhD	123	34.6
Years of experience in nursing practice		
Less than 5	176	49.2
6-10	93	25.7
11-15	34	9.7
16-20	53	15.1
Years of experience at the studied hospital		
Less than 1	39	11.1
1 - 5 years	208	59.4
5 - 10 years	87	24.9
More than 10	15	4.3
Duration of computer usage (years)		
Less than 1	39	11.3
1-2	43	12.3
3-4	60	19.3
5-9	216	61.7
More than 10	36	10.3
Level of computer skills		
Low	40	13.3
Average	229	64.8
Excellent	85	25.1
Have you ever had formal computer training?		
Yes	58	15.9
No	298	84.3

4.2. Cronbach's Alpha

According to the second table, Cronbach's alpha measures perceived usefulness and ease across twenty-eight items.

Table 2. Cronbach's Alpha coefficient

Scale	Cronbach's alpha	Items
Perceived Usefulness	0.849	14
Perceived Easiness	0.868	14

4.3 Perceived Usefulness (PU) Of EMR

According to Table 2, 33% of respondents indicated that their jobs would be more challenging without using an EMR, which is consistent with recent research showing that doctors and nurses alike have difficulty reading handwritten notes. As a result of incorrect handwriting interpretation, one respondent was concerned that medication could be administered incorrectly [52]. Moreover, only 11% strongly disagreed that EMRs enable them to coordinate and manage their work. Even so, the purpose of implementing EMR was to enable medical and nursing staff to perform their duties more efficiently [53]. EMRs were reported to improve job performance by most of our respondents.

In addition, 43% of respondents agreed that EMR addresses job-related needs, however, 31% denied that it saves time. In previous studies, the time required to complete tasks was often perceived as a negative aspect

of using technology [54-56]. Clinical aspects of their work have been found to be improved by EMRs in most instances. Also, EMRs enable more tasks to be accomplished; 11.3% strongly disagree that they increase their efficiency. According to 12% of respondents, using an electronic medical record has reduced the amount of time spent on unproductive activities. Yet, excessive login times have been reported to affect usability negatively [56].

Research has shown that nurses perceive that they spend a significant amount of time on paper records, leading to incomplete documentation [52]. Additionally, participants reported an increase in job efficiency of 66% as a result of the implementation of an EMR. In contrast, 22% of respondents did not agree that EMRs improved the quality of their work. According to an investigation, nurses in an outpatient department of a tertiary hospital were satisfied with EMRs based on their use, quality, and satisfaction with the system. Furthermore, there was a positive correlation between the service, quality, and satisfaction domains of the EMR [57]. Computerization is also viewed by nurses as a means of reducing errors. Clinical EMR systems have been evaluated positively by nurses in terms of clinical care, quality of services, and information quality [58]. In our study, 47% of respondents indicated that the use of electronic medical records increased their productivity.

Furthermore, 54% of respondents reported that they made their jobs easier. Nearly 83% of physicians and 57% of nurses identified the ease of access to and availability of an EMR as significant advantages or benefits [59]. It was found that 64.4% of respondents agreed or strongly agreed that EMR systems are useful in their jobs, while approximately 24% disagreed or strongly disagreed.

Table 3. Perceived Usefulness (PU) Item

Perceived Usefulness (PU) Items	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree	M (SD)
1. My job would be challenging to perform without EMRs.	29.2	22.3	17.4	22.5	8.6	3.1 (1.29)
2. Using EMRs gives me greater control over my work.	13.2	20.8	19.7	33.5	13.9	3.2 (1.26)
3. Using EMRs improves my job performance.	10	18.9	23.6	34.7	13.3	3.2 (1.16)
4. The EMRs system addresses my job-related needs.	8	12.7	15.9	42	21.5	3.3 (1.18)
5. Using EMRs saves me time.	11.4	19.5	21.3	32.6	15.2	3.2 (1.25)
6. EMRs enable me to accomplish tasks more quickly.	10.0	20.7	22.6	33.0	13.7	3.2 (1.22)
7. EMRs support critical aspects of my job.	8	17.9	28.1	38.9	10.5	3.3 (1.12)
8. Using EMRs allows me to accomplish more work than possible.	9.4	18.4	25.2	36.9	10.1	3.2 (1.14)
9. Using EMRs reduces the time I spend on unproductive activities.	12	16.5	23.0	40	11.4	3.2 (1.18)
10. Using EMRs enhances my effectiveness on the job.	14.5	14.5	18.4	40.2	20.4	3.3 (1.16)
11. Using EMRs improves the quality of work I do.	14.8	6.5	18.4	40.2	20.4	3.2 (1.14)
12. Using EMRs increases my productivity	18.4	9	27	36	10.5	3.2 (1.13)
13. Using EMRs makes it easier to do my job.	8.7	16.7	25	39.3	11.0	3.3 (1.13)
14. Overall, I find the EMR useful in my job.	12.6	9.8	13	40.9	24.4	3.4 (1.17)

4.3 Perceived Ease-of-Use (PEOU) of EMR

There were 29.6% who disagreed, and 22.4% strongly disagreed, as indicated by table 3 (Perceived Ease-of-Use (PEOU) Items), indicating that EMRs are commonly confusing to them. In the opinion of some nurses, using computers for data entry and retrieval is quick and easy [52]. Small number of respondents strongly agree that they frequently need to improve their use of electronic medical records. The majority indicated that EMRs are difficult to use. Even so, it has been reported that 14% of physicians and 22% of nurses find system downtime frustrating, including times when the system locks up, and or freezes [59].

Additionally, 29.3% of respondents stated that they frequently read manuals when using EHRs. In response to the question of whether interacting with an electronic medical record system requires substantial mental effort, 14.3% strongly disagreed. Several participants expressed concern about the time required to open the application in the literature[59]. Around third of of participants believe that EMR systems are inflexible and insensitive in terms of their interaction capabilities, which is largely consistent with a study indicating that physicians and nurses highlighted the need for more training, the need to fix software bugs, the improvement of speed and reliability, and the need to make the application easier to use [59].

The results indicate that 38.8% of users are able to utilize the EMR system in a manner that meets their needs. The use of computers for data entry and retrieval was also perceived as a quick and simple process by some nurses [52]. More than 5% reported that EMR acting unexpectedly. The EMR system was easy to navigate and use in half of the cases (50%). In item 12, the user was asked whether using an EMR made it easy to remember to perform a task. The results of an investigation indicate that, according to most nurses, electronic medical records simplify their tasks [60]. Based on the results of the analysis, less than 10% strongly disagreed with the statement and 15.8% disagreed with it. According to 39.6% of respondents, the EMR provides reliable and practical guidance, 10.3% strongly agree, and 24% are unsure. According to the survey results, 40.7% of respondents agree that their EMR system is user-friendly, and 22.7% strongly agree. The results show that the PEOU and PU positively correlated; thus, H1 and H2 accepted and rejected H3.

Table 4. Perceived Ease-of-use (PEOU) Items

Perceived Ease-of-use (PEOU) Items	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree	M (SD)
1. I often need clarification when I use the EMR system.	22.4	29.6	18	22.8	8.9	3.1 (1.29)
2. I make errors frequently when I use the EMR system.	17.1	39.5	22.8	18.6	2.0	3.3 (1.14)
3. Interacting with the EMR system is often frustrating.	17.6	41	18.7	18.1	6.6	3.3 (1.11)
4. I need to consult the user manual often when using EMRs.	14.3	29.3	24.2	27.4	4.8	3.2 (1.13)
5. Interacting with the EMR system requires much mental effort.	13.5	29.9	22.3	29.7	6.9	3.1 (1.15)
6. I find it easy to recover from errors encountered while using electronic medical records.	10.0	20.7	22.6	33.0	13.7	3.2 (1.20)
7. The EMRs system is rigid and inflexible to interact with.	11	29	26.9	28.2	9.2	3.1 (1.13)
8. I find it easy to get the EMR system to do what I want	10.1	22.7	28.0	30.0	9.3	3.0 (1.15)
9. The EMRs system often behaves in						

Perceived Ease-of-use (PEOU) Items	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree	M (SD)
unexpected ways.	10.6	29.2	30.5	24.2	5.5	3.2 (1.11)
10. I need help using the EMR system.	10.8	29.1	23.0	28.9	8.2	3.1 (1.17)
11. My interaction with the EMR system is easy to understand.	7.6	21.2	21.4	40.2	10.2	3.2 (1.13)
12. I can easily remember how to perform tasks using EMRs.	7.2	15.8	19	45.7	13.9	3.3 (1.10)
13. The EMRs system provides helpful guidance in performing tasks.	7.8	21.8	25.5	38.8	9.8	3.3 (1.10)
14 Overall, I find the EMR system easy to use.	7.3	12.4	17.4	40	24.4	3.4 (1.15)

5. Conclusion

Technology is being integrated into a variety of aspects of Saudi society in ways that were not prevalent in the past [60,60-68]. As a result of the significance of HIT in the age of digitalization, a variety of stakeholders in Saudi Arabia are interested in investigating, integrating, evaluating, and implementing it. Through the use of TAM, we explored nurses' perceptions of EMRs in Saudi Arabia. According to our results, the TAM model is valid for measuring nurses' acceptance and use of electronic medical records. According to this study, nurses' acceptance of electronic health records (EMRs) is influenced by perceived usefulness and ease of use. Researchers have demonstrated that barriers to technology implementation are usually the result of changes in nursing workflows and processes rather than the functionality of the technology itself [69,70]. A change in workflow was also identified as the most significant barrier to acceptance [69,70].

The Unified Theory of Acceptance and Use of Technology (UTAUT) and the Technology Acceptance Model (TAM) are associated with a general acceptance of e-health applications by healthcare professionals. According to their research, both perceived usefulness (PU) and perceived ease of use (PEOU) were positively related to the intention to use technology [71]. The nurses' attitudes should be assessed using innovative methods, and this matter should not be overlooked. It is the role of nursing to coordinate and provide patient care and health services, thus making them an integral part of the patient care chain [72–77]. As a result of their work, they often interact with EMR systems. It is their responsibility to make nurse diagnoses, confirm physician orders, draft nursing care plans, record vital signs, and sometimes transcribe physician orders [78]. Nurses must have adequate training facilities and confidence in their computer skills in order to provide optimal patient care.

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