"Exploring the Barriers and Facilitators to the Uses of EMR Software by healthcare workers in Emergency Department at a King Khaled Hospital in Hail Region."

Researcher:

Shahad Khalid Ayidh Al-Hammzani

Kingdom of Saudi Arabia

Ministry of Higher Education

Hail University

Supervised by

Muneef ALShammari

PROFESSOR ASSISTANT OF HEALTH INFORMATICS

Health Informatics Department

College of public health and health informatics

University of Hail

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ABSTRACT:

Objectives There is an increasing trend in the use of electronic medical records (EMRs) for clinical documentation. However, more knowledge is needed on how to assure and improve the uses of EMR software at ED. This study aimed to explore healthcare workers' experiences and perceptions of barriers and facilitators of uses of EMR software in the Chinese context.

Setting One tertiary hospital in Hail Provence, Saudi Arabia.

Participants tenth healthcare workers with experience in using EMR software participated in the study.

Methods A qualitative study based on face-to-face semi structured interviews was conducted from January to March 2023. The interviews were audio recorded and transcribed verbatim. Data analysis was performed using the inductive thematic analysis approach.

Results The main themes included barriers to the use of EMR software that related to (a) Information technology IT Infrastructure, (b) Lack of IT support services, (c) Lack of EMR software training provided to users, and (d) Poor performance of EMR software. To improve the use of EMR software by healthcare workers at ED, suggestions from participants included: well staff training, well-developed EMR software, High qualified of IT team support, and well IT infrastructure.

Conclusions These results provide a basis to begin to address current barriers and ultimately to improve the uses of EMR software at ED in Hail province.

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Introduction

Crowding in emergency departments (EDs) is a problem that affects all healthcare systems globally as well as in Saudi Arabia and is linked to a higher incidence of a number of negative consequences (Han, France et al. 2010, Krall, Cornelius et al. 2014, Al-Qahtani and Khubrani 2021). ED crowding is defined as the situation where the demand for emergency services exceeds the ED's capacity to provide care for patients. The current definitions are quite ambiguous and do not include any time measurements. The American College of Emergency Physicians, for instance, defines ED crowding as a situation in which the identified need for emergency services exceeds the resources available for patient treatment in the ED, hospital, or both (Physicians 2019). To give a quantitative measure for ED crowding, the literature has made many attempts. ED nationwide are encountering extended delays in evaluating patients. Subsequent attempts have been made to improve the ED patient evaluation process during the stay at EDs, such as additional ED beds, additional hospital beds, and enhanced patient throughput and discharges. Overcrowding in EDs has detrimental effects, including delaying patient admission, lowering the standard of care, lengthening wait times, decreasing patient satisfaction, increasing the number of patients who leave without being seen, and increasing medical errors.(Carter, Pouch et al. 2014, Boulain, Malet et al. 2020).

The literature generally suggests that ED overcrowding may have a negative effect on patient outcomes. As a result, it is important to evaluate the relationships between ED crowding and patient outcomes. To the authors' knowledge, the majority of study on this topic has been done in Western nations, while Saudi Arabia and Hail region specifically has only seen a small number of such studies. Therefore, the primary goal of the current study is to investigate any potential links between the use of EMR software in the emergency department and patient durations of stay at tertiary hospitals in the Northern

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Province of Saudi Arabia. It is intended that this study would close that gap, produce solid evidence on the problem, and advance our understanding of the relationship between ED crowding and patient outcomes.

This research contributes to the modification of the electronic records system in the emergency department and will help facilitate the use of the system and the speed of patient service in a short time.

Background

The emergency department serves an unscheduled patient population with anticipated needs for emergency care, which is open 24 hours a day,(Ramsten, Martin et al. 2020) 7 days a week. For many patients, it is the "front door" to the province's health care system, accounting for approximately three-fifths of inpatient hospital admissions. The length of the patient's stay in the emergency department begins when they enter the unit and continues until the patient is either discharged home, admitted to the hospital, or transferred to another facility defined prolonged emergency department length of stay for more than six hours; It is used as a performance indicator to evaluate the emergency department's care quality. Patients and their families are dissatisfied with the length of stay in the emergency department, which has an impact on patient care and is regarded as one of the greatest challenges for emergency physicians. The EMR play an important role to improve the length of stay in emergency department. The health care system in Saudi Arabia can be classified as a national system for providing free health care services to citizens through a number of government agencies. At the present time, the growing role and increasing participation of the private sector in the provision of health care services is noted. King Khalid Hospital is the first reference hospital in Hail, with a bed capacity of 285 beds and several medical clinics.

The emergency department is considered important because it is the front door for patients and reflects their satisfaction with the hospital. This research is considered important as it contributes to raising the level of service provided to the patient and as an assistant to health care providers In addition to the articles that have been read, some of them a study in USA talked about the impact of electronic health records in health care, but it was not the same gap in my research topic. In another study in Indonesia, the factor affecting the length of stay was the duration of consultation with the specialist and the duration of examinations and x-rays.

The health system in the Kingdom of Saudi Arabia aims to ensure the provision of comprehensive, integrated health care to the entire population in a fair and accessible manner. The country, represented by the Ministry of Health, works to provide an integrated network of health care services covering all regions of the Kingdom. The Ministry, in cooperation with the regions' councils, determines the need, locations, and levels of providing these services. Care according to the geographical and demographic situation and patterns of diseases prevalent in the region. Health care is provided in government medical facilities to citizens free of charge and according to the strategic plan that meets the needs of the health sector. The health system in the Hail region is undergoing a national transformation in improving electronic medical files and medical coding.

objectives

Length of stay is a key measure of emergency department throughput and a marker of overcrowding. Time studies that assess key emergency department processes will help clarify the causes of patient care delays and prolonged Length of stay. The objectives of this study were to explore the barriers and the facilitators of the use of EMR software by healthcare workers and explore the factor that lead to increase the length of stay at ED in King Khalid Hospital.

Methods

Study design

This study employed a qualitative design using face-to-face semi-structured interviews. This method was chosen because it makes it easier to obtain extensive data on the subject while still being adaptable and participant-guided, which makes it ideal for exploratory research (Thorogood and Green 2018). An interview schedule was developed based on the existing literature and built around the usability and the accessibility of EMR software. All participants were asked about their experience with the usability and the accessibility of EMR software.

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Participant recruitment

In this study, purposive sampling was employed. Healthcare professionals who met the following requirements were allowed to participate in the study: they had at least two years of professional experience; they used an EMR system to manage patient data, including clinical documentation, physician order entry, and result extraction. Age, gender, educational attainment, and medical specialties were taken into consideration during the hiring process to guarantee diversity.

Participants were recruited from the Emergency Department at King Khaled Hospital, which considers the main territory care center in Hail province. This study involved 10 interviews with clinicians including physicians, nurses, radiologists, and laboratories. These clinicians had participated in the larger focused exploratory study on addressing users' views of EMR software at ED. The majority of the participants were male. There was no pre-existing relationship between the clinicians and the researchers. The criteria for the inclusion of clinicians were those with at least two years of using EMR software experience and one year working in ED.

Data collection

All participants were interviewed face-to-face by a single member of the study team. All participants interviewed at King Khaled Hospital ED because of privacy concerns. Prior to the interview, informed consent was gained from each participant. 33 to 85 minutes were spent on each interview. Verbatim transcriptions of every interview were made and then compared to the audio recording to ensure accuracy.

Questions were asked about how EMR software is used during working time at ED.

1- What is the reason for the patient's length of stay in the emergency department?

2- The cases of length of stay for patients in the emergency department urgent cases?

3- Is the use of EMR a reason for the LOS?

4- What are the barriers that prevent the use of the EMR in LOS?

5- Do you have enough skills to use EMR?

6- Are there sufficient skills to use the EMR

7- Is there sufficient support from the IT department in case of a system breakdown?

8- From your point, what are the things that you suggest or add in the EMR program to facilitate its use?

Data analysis

The anonymized audio records were transcribed verbatim by the researchers. The researcher used NVivo V.10 to assist in data management and analysis. The transcripts were analyzed using inductive thematic analysis (Braun, V. and Clarke, V., 2006. Using thematic analysis in psychology. Qualitative research in psychology, 3(2), pp.77-101.). The analysis consisted of six phases: familiarization, generating initial codes, searching for themes, reviewing themes, defining and naming themes and producing the final results. The transcripts were separately coded, and researchers met frequently to discuss the discovery of themes in order to assure validity and dependability. We kept conducting interviews and reviewing the transcripts until no new themes were apparent; at that point, we came to the conclusion that theoretical saturation had been reached. All team members evaluated the final themes during a discussion meeting to verify the data's interpretation.

Results

Tenth healthcare providers from deferent profession were interviewed in the study. Five potential participants refused to take part due to heavy workload at ED. Table 1 provides demographic characteristics and treatment status of the participants. There were seven men and three women. All respondents were in one hospital. Respondents were from various healthcare specialties, including nursing, radiology, general medicine, laboratory, and general surgery.

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Table 1: Demographics of the participants

Profession	Gender	Age	Nationality	Year of work Experience at ED
Emergency medicine doctor	Male	30 y	Saudi	2 years
General Medicine	Male	29y	Saudi	2 years
Surgeon	Male	53y	Egyptian	14 years
Nursing specialist	Male	28y	Saudi	3 years
Nursing specialist	Female	27y	Saudi	2 years
Nursing specialist	Female	27y	Saudi	2 years
Computer specialist	Male	29y	Saudi	5 years
Radiologist specialist	Male	30y	Saudi	5 years
Laboratory specialist	Male	32y	Saudi	9 years
Laboratory specialist	Female	30y	Egyptian	2 years

Barriers to use the EMR software.

The findings in this study enabled us to identify 6 barriers to use the EMR software which are experienced by healthcare professionals: (a) Information technology IT Infrastructure, (b) Lack of IT support services, (c) Lack of EMR software training provided to users, and (d) Poor performance of EMR software. **Table 2** shows a list of themes of the perceived barriers.

Table 2: Overview of key themes	
Barriers	**Facilitators**
Information technology IT Infrastructure	Well IT Infrastructure,
Lack of IT support services	Qualified IT team
Lack of EMR software training provided to users, and	Training of staff
Poor performance of EMR software.	Good quality of EMR software.

A. Information technology IT Infrastructure

Most participants mentioned that poor IT Infrastructure would affect the use of EMR software and therefore affect work performance. User satisfaction may suffer as a result of a malfunctioning infrastructure. When healthcare providers use EMR software, they anticipate a quick and effective response. For example, one physician noted "Infrastructure may translate into comfortable working circumstances, which can motivate individuals to enjoy their jobs and foster innovation." Also, the lack of hardware devices such as mobile or tablet could affect the use of EMR software because healthcare providers need to wait a long time until they find a device to access and use. For example, one participant said, "There are not enough devices such tablet, Mobile COWs (Computer on Wheels) or laptop to use at ED, and sometimes I have to wait long time to enter the patient data into the EMR software.

B. Lack of IT support team services

Some participants mentioned that a lack of IT support team services could lead to a decrease in the productivity of work or could lead to the shutdown of the whole work, in particular during the system down. For example, one participant indicated that "the IT team take much time to fix the problem either in the network or for EMR software". Other participants mentioned "that some IT teams are not knowledgeable much about EMR software, and sometimes they call the EMR vendors to fix it". Apparently, the lack of IT team and lack of knowledge can be a barrier or facilitator to use the EMR software. Healthcare providers are unlikely to be satisfied with using such a system that IT support team are not professional to fix any issues. One participant noted that "The EMR software vendor is working remotely, and they do not exist in our hospital, so it takes time to fix any issue related to the software".

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C. Lack of EMR software training provided to users.

Another barrier to utilizing EMR software among healthcare providers at ED is training and education. They are not provided with early education or training before the EMR software is launched or implemented. If this was provided to them, users could use the system in a friendly way. Many participants mentioned that "I have very good knowledge about Microsoft Office software such as word, PowerPoint, and excel, but I didn't receive good training on how to use the EMR software". Some participants illustrated that poor-quality vendor training was a barrier to clinicians' use of EMR software. Another participant mentioned that "I believe the course that I have received from EMR vendor is not good enough because the instructor just explained to us the basic instruction on how to use the EMR software".

D. Poor performance of EMR software.

An additional barrier to utilizing EMR software among healthcare providers at ED is poorly performing EMR software which can have significant consequences for healthcare organizations and might lead to an increase in the length of stay at ED. Poor performance can compromise clinicians' experiences, decrease process effectiveness, lead to workarounds, distract resources, and impair overall corporate success. Almost all participants pointed out that the low EMR performance is a key barrier to using EMR software. They indicated that "The EMR software is sometimes unsuitable to use because of the old version and very slow data processing". Other participants noted that "The EMR software is difficult to use and the performance very slow as well". Three participants mentioned that "the International Classification of Disease -version eleventh (ICD-11) is not embedded with EMR software which makes it difficult for clinicians to work with".

Facilitators to use the EMR software.

All of the interviews include discussions on how to improve and increase the use of EMR software at ED. Table 2 also presents themes of the perceived facilitators: (a) well IT Infrastructure, (b) Qualified IT team, (c) Training of staff, and (d) Good quality of EMR software.

A. well IT Infrastructure

A well-developed infrastructure is the basis for the efficient functioning of EMR software, which leads to many benefits of EMR software which include better and quicker care, tracking results and data over time, identifying patients who require screenings and preventive care, better patient health data security and privacy, supports data-based decisions and overall improve the quality of healthcare that delivery to patients. Participants suggested that a good infrastructure could help clinicians to decrease the heavy work at ED. One physician said, "I suggest that every single caregiver at ED should have a tablet to do clinical documentation easily". Another Participants suggested "At ED, there should be extra devices such COW, laptop, or tablet, that physicians no need to wait a bit longer to do the clinical documentation".

B. Qualified IT team support

Some participants suggested there was a potential for improving and increasing the use of EMR software among healthcare providers. During the discussion with participants, they suggested that qualified IT teams are the stewards of the hospital's portfolio of technology investments. One physician said, "IT team are accountable for ensuring that EMR software is functioning effectively to keep the healthcare organization running well". One clinician said, "I sometime faced a network issue and the software not running smoothly, and when I call the IT team, they didn't fix the issue till they call the software vendor to tell them the instructions to solve it". Participants suggested that the IT team should be trained enough and able to solve the problems, or the software vendor team should be available to fix any issue related to EMR software.

C. Training of staff

Staff training was a perceived facilitator for using EMR software efficiently. Participants suggested that healthcare workers must receive enough training regarding the utilization of EMR software functions, as systematic clinical documentation for regular healthcare delivery is essential for enhancing the high quality of healthcare services. One participant said, "I suggested that healthcare workers should get proper practical training for EMR software because lack of practical training might affect the success of the uses of EMR software".

D. Good EMR software

The EMR software needs to be developed well to make clinical documentation more convenient and effective for healthcare workers. Many participants suggest that EMR software should be designed and developed well to reduce the heavy workload at ED. They suggested that the EMR software should be user-friendly and not complicated. One participant mentioned, "I assume that the EMR should help me do the work fast and efficiently, not make the work complicated regarding the usability of the EMR software".

Discussion

In this study, we tried to explore and identify barriers and facilitators to the uses of EMR software by healthcare workers at ED. The main themes included factors related to IT Infrastructure, IT support team, training, and the performance of EMR software. Understanding the elements that influence the uses of EMR software may ease present obstacles and ultimately improve the uses of EMR software, given the trend toward using EMR data for clinical documentation in order to deliver the best healthcare services.

IT infrastructure was identified as a key barrier to the use of EMR software at ED. We found that poor infrastructure of IT that includes hardware and software lead to the obstacle to use the EMR software properly. It is not surprising that some participants considered that the poor infrastructure of IT does not meet the needs requirement of EMR software to run successfully. This point is consistent with previous discussions of that IT infrastructure was one of main barriers to use EMR software properly [6]. EMR software adoption would be impacted by bad IT infrastructure, which would also have an impact on work performance. An inadequate infrastructure could lead to decreased user satisfaction. They expect a prompt and efficient response when healthcare workers use EMR software. A good IT infrastructure may result in pleasant working environments, inspiring people to enjoy their professions and promoting innovation. Other studies have also reported that inadequate IT infrastructure had an impact on the uses of EMR software [7].

Additionally, participants mentioned that a qualified IT support team may be an effective way to improve the uses of EMR software, encouraging healthcare workers to be more responsible for clinical documentation in EMR software. Participants believed that a lack of IT support team services, particularly during a system disruption, could result in a decline in work productivity or the shutdown of the entire operation. Previous studies demonstrated the lack of IT teams' knowledge or not qualified could lead to users to resistance of using EMR software [8]. User satisfaction was closely tied to system utilization and the IT support team. Additionally, it had a modestly positive correlation with IT knowledge, computer access method, system perception, and information quality [8].

To improve the approach of clinical documentation for healthcare workers, the EMR software must be well-developed. Many participants advocate for carefully planning and developing EMR software to lessen the ED's excessive workload. They recommended that the EMR software be simple and easy to use. Previous research has shown that using EMR software improperly can lead to errors and that EMR weaknesses in design and difficulty in usage might potentially result in unacceptable healthcare quality. System complexity and a lack of user-friendly functionality led to usability issues [9].

Staff training was seen as a facilitator for effective EMR software use. As systematic clinical documentation for routine healthcare delivery is vital for improving the high quality of healthcare services, participants recommended that healthcare workers obtain enough training about the use of EMR software functionalities. Previous studies demonstrated that Low knowledge and poor training of healthcare workers on use of EMR software remains a major challenge [9-10]. Errors caused by EMR software design faults, system performance problems, inadequate decision support rules, and human mistakes may come from insufficient user training on how to utilize EMR software.

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Limitation

The small sample size due to difficulties recruiting participants, especially at ED, made it difficult to ensure that data saturation and completeness were achieved. Another limitation of this study include that the participants were recruited from one healthcare organization in Hail Provence and that the generalizability of the findings may be limited because of the small sample size. There is also a possibility that we had continued to interview, and other themes may have emerged. However, all of the research team felt that no new information was forthcoming, and that saturation had been achieved with the tenth participants. The primary researcher in our study conducted every interview. Although her cultural background and prior experiences may have had an impact on the data collection and analysis, she was seasoned researchers who had conducted qualitative studies before, and a meeting was organized to assure the rigor of interpretation. Only three participants were women, which precluded exploration into possible differences between how men and women interact with EMR software. Future studies involving larger and more diverse samples will be important to promote a better understanding of the barriers and facilitators of the uses of EMR software. We believe that these findings can contribute to an increased understanding of barriers and facilitators of the uses of EMR software at ED.

Conclusions

EMR software can transform the way healthcare services are delivered when these technologies are designed, implemented, and used properly. If EMR software is designed and used improperly, it could add to the already complex process of delivering healthcare, which could cause treatment delays brought on by ineffective human-computer interactions or data loss and that might lead to increase the length of stay at ED. IT Infrastructure, IT support team, training, and the performance of EMR software.

We have identified various barriers to the use of EMR software in the Saudi context, which may have impacted on the validity and generalizability of research findings. Poor performance of EMR software and not qualified IT support team was emphasized as a key factor, which is the basic prerequisite before further enhancing the uses of EMR. The evidence provided by this study demonstrates that there are several barriers that influence the mature use of EMRs by healthcare worker at ED that could usefully inform future initiatives to sustain health information technologies within ED setting.

7. Declarations

I am Shahad Khaled Al-hammzani, No. s20210170, a master's student from the University of Hail. I acknowledge that my research project that was implemented at King Khalid Hospital for the Executive Master's Program in Electronic Health is the result of my studies and research. All data and information collected in this study are original and real. Supervisor: Dr. Munif Al-Shammari

7.1 Scientific and Ethics approval

In this section, include a statement of the scientific and ethics approval as given for this research, as well as the approving entity. Copies of these approvals should be included in Appendix B.

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