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A Scoping Review of Research Involving Nurses and Electronic Health Records in Middle Eastern Countries

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Abstract

Aim: Nurses effective and efficient use of electronic health records (EHRs) is essential for the successful adoption of the technology. In recent years, countries within the Middle East have experienced an increase in the installation and implementation of such technologies, with nurses representing the largest user group. As such, the aim of this literature review is to understand the scope of research containing nurse participants related to the technology and its use in the region.

Methods: A scoping review methodology was utilized to conduct a literature review with 5 online databases searched. Two researchers reviewed all of the studies and applied inclusion and exclusion criteria. Any discrepancies related to inclusion were discussed and agreed upon.

Results: Twelve studies were discovered that met the inclusion and exclusion criteria. These studies originated in Saudi Arabia, Iran, Oman, Kuwait, Israel and Turkey. Most studies focused on nurses' satisfaction or attitude toward the EHR, and utilized a quantitative cross sectional survey methodology. Great variability existed in the settings and types of EHRs discussed in the literature, which makes the generalizability of findings challenging.

Conclusion: Despite a growing number of implementations of EHRs in the region, little research exists on how the systems are currently used by nurses. Research that explores this topic in an effort to identify ways to enhance its use would be beneficial.

Keywords

Nursing, Electronic health record, health information technology, literature review, middle east

Introduction

Public and private healthcare organizations in Middle Eastern countries are investing in electronic health records (EHRs) to support the management of data and to improve the quality and efficiency of care delivery [1,2]. Some countries such as Saudi Arabia [2], Turkey [3], and Kuwait [4] have committed to adopting and implementing EHRs as a part of a larger health information and communication technology strategy. Given the cultural and language similarities in the region, increasingly there is a need for organizations to look to one another to obtain information about how systems can be adopted in meaningful ways. As such, opportunities for facilitating knowledge translations have been established in recent years. Included in this are the Healthcare Information Management System Society- Middle East, Middle East Healthcare Informatics Summit and the Mobile Health Summit Middle East.

Nurses represent the largest group of healthcare professionals in Middle Eastern countries expected to use EHRs when implemented in a particular care setting [5]. The quality of nurses' usage in the region is therefore important as organizations strive to meet their health information technology goals. However, implementation of EHRs can be challenging for nurses, as they are required to learn the intricacies of a new system, while maintaining a high quality of care delivery. In some situations, nurses may initially be required to 'double chart' (record the same observation electronically and on paper) while the system is being implemented in phases.

The context in which the EHR is implemented plays an important role in ensuring that the conditions facilitate the nurses' use of the technology. Additionally, nurses have varying comfort levels with the use of a computer, have different experiences using a computer at work, and may or may not utilize a computer in their personal lives. Within the region, the nursing workforce is comprised of a number of internationally educated nurses who may or may not have used EHRs in their professional training. These differences can influence nurses' attitudes toward [6,7], and ability to use an EHR both efficiently and effectively [8].

Aim

The aim of the literature review is to understand what research focusing on electronic health record use has been conducted with nurse participants in Middle Eastern countries.

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Methods

A scoping review methodological framework [9,10] adopting the Arksey and O'Malley [11] approach was utilized. One of the goals of this approach is to "examine the extent, range and nature of research activity" [11] in a given field. As the aim of the review is to understand the landscape of research within a specific population (nurses) and topic area (EHR use), a scoping review is an appropriate methodology.

Arksey and O'Malley outline five stages to conducting a scoping review. In the first stage, the aim of the literature review is clearly identified, as the specific search strategy is developed based on this aim. A wide approach using broad terminology is encouraged at this time to be able to ensure breadth of coverage. In the second stage, studies are identified through a variety of different methods to ensure that all relevant studies have been included. In this review, studies were identified through searching several online databases and scanning reference lists. Databases searched included PubMed, Cochrane, Embase, Ovid (Medline) and the Cumulative Index for Nursing and Allied Health Literature (CINAHL).

The purpose of the third stage of conducting a scoping review is to select the appropriate studies to be included in the review [11]. Inclusion and exclusion criteria were determined and then applied to the discovered articles. For articles to be included in the review, the study setting needed to be within a Middle Eastern country. Countries that were considered to be Middle Eastern included Saudi Arabia, Yemen, Oman, Egypt, Iraq, Turkey, Iran, Syria, Jordan, Lebanon, Israel, Kuwait, Qatar, United Arab Emirates and Bahrain. Additionally for studies to be included in the review, they needed to have nurses as the participants and focus on electronic health record use in some capacity. Initially only English articles were to be included, however since none were found in other languages, no articles were eliminated and thus this inclusion criteria was deemed unnecessary. The process for article discovery is shown in figure 1.

In the fourth stage, charting of the data occurs where researchers sort through the findings and identify key themes. In this review, a table was created to identify key information from each study inclusive of the authors, year of publication, country of study, study type, participant group, study aims, methodology, findings and important results. This can be seen in table 1.

Finally, during the fifth stage, the literature is collated, summarized and the results are reported. The Kuwait Cancer Control Center- University Health Network research team then met to determine important findings, and to discuss the implications of the studies. The results of these discussions are summarized in the discussion section.

Results

After duplicates were removed and the remaining articles screened for the inclusion and exclusion criteria at the title, abstract, and full article stage by two researchers, twelve articles remained (Figure 1). The countries in which these articles were published included Saudi Arabia, Iran, Oman, Kuwait, Israel and Turkey (Figure 2). Publications took place from the year 2003 to 2015 with the most amount of research being published in the year 2014 (Figure 3). Most (74%) articles utilized a quantitative research methodology usually consisting of a cross sectional survey of nurses. Articles containing mixed methods and qualitative research designs were also uncovered, however in lesser quantity (Figure 4). Eleven articles reviewed were published in peer-reviewed journals, and one was a

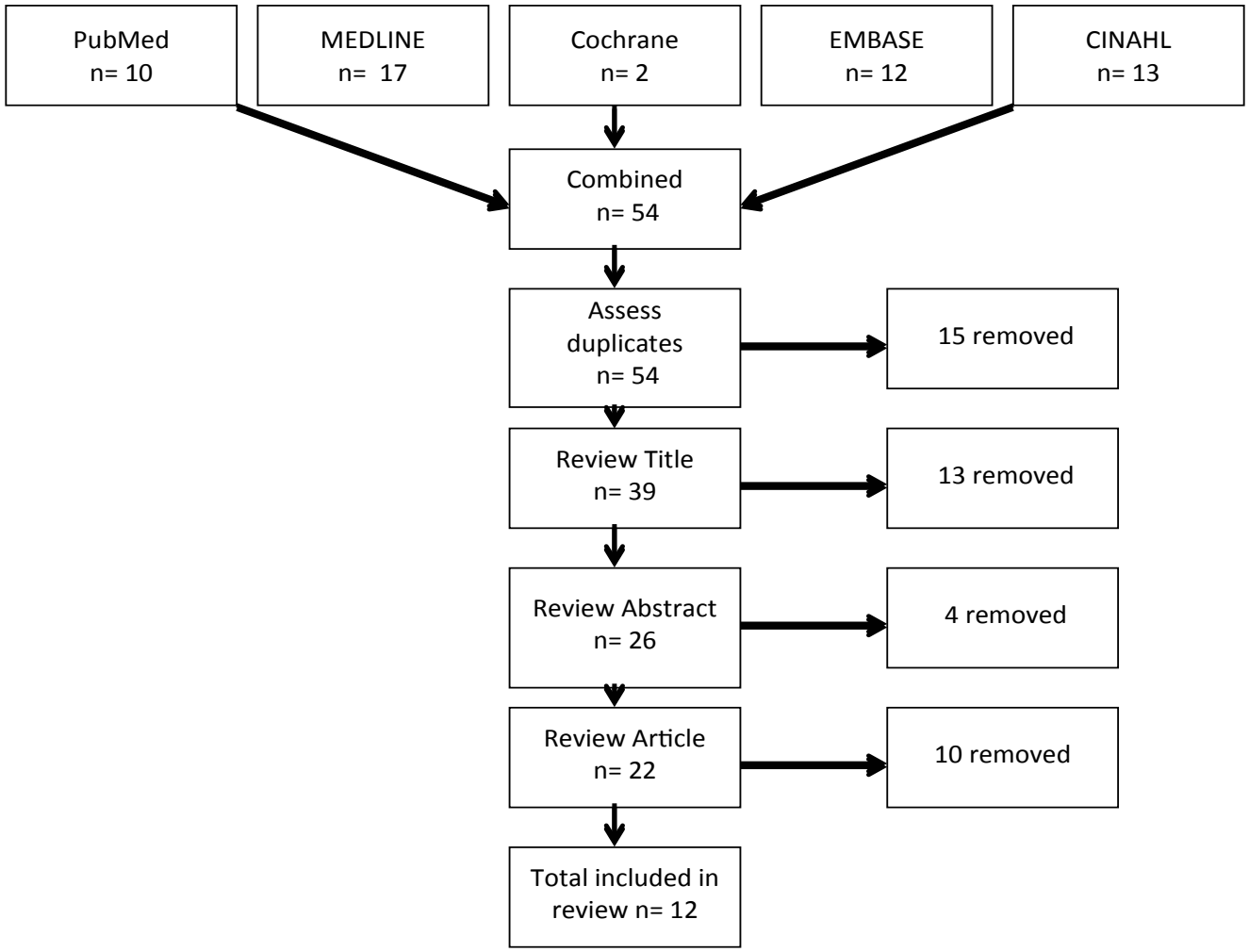

Figure 1: Flow Chart of Literature Search

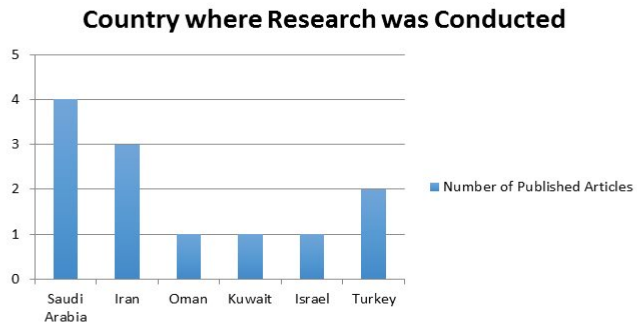

Figure 2: Countries where research was conducted on nurses and EHRs

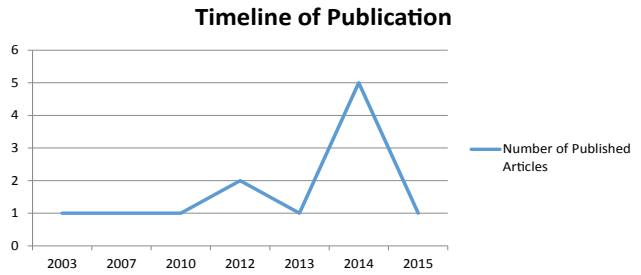

Figure 3: Timeline of publications on nurses and EHRs in Middle Eastern countries

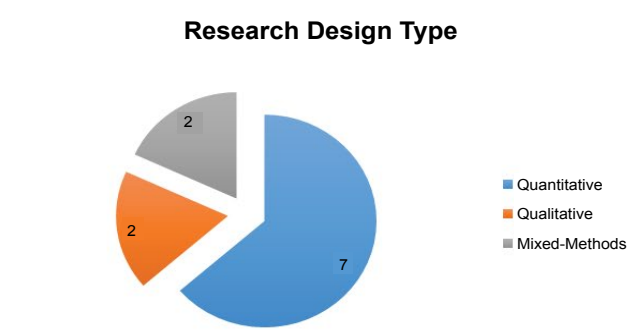

Figure 4: Research design utilized by studies

doctoral dissertation thesis from the University of Missouri in the United States. A summary of all published work and their findings is shown in table 1.

In 2014, a study examining the association between computer literacy and training, on the clinical productivity and user satisfaction of health professionals using an Electronic Medical Record (EMR) was conducted in Saudi Arabia [2]. In this study, surveys were distributed at a family health centre in Prince Sultan Medical Military City amongst nurses and physicians as these health professionals were deemed to represent the largest group of users of the technology. Results of the study showed that nurses with higher levels of computer literacy, and who were younger in age were more satisfied with their use of the system. However, in general nurses were positive about using the EMR in their practice and believed that using the system did not require advanced computer skills. Nurses and physicians reported making fewer mistakes related to transcription, and that missing information was less frequent in patient charts with the EMR present. Another study that took place in Saudi Arabia explored nurses' attitudes toward a computerized physician order entry (CPOE) and whether the electronic system could improve nurse-physician communication in the medication ordering process [12]. Surveys were distributed to 174 nurses, of which 146 were completed and returned. The majority of nurses perceived the CPOE to support their workflow and that the system allowed easier access to patient's medical information. Nurses who were employed for a longer duration and who worked in surgical departments had more negative views toward nurse-physician communication utilizing a CPOE. Some nurses felt that the system was not sufficient and that follow-up was required with physicians using phone calls or written notes to clarify orders.

In a study of nurses' perceptions of a health information system (HIS) in Riyadh, Saudi Arabia, nurses reported spending more time charting on the electronic record than they did on paper charts [5]. In this study, nurses were asked via a survey to communicate their satisfaction with using the system. Both level of education and years of experience were found to be significant predictors of their satisfaction with the HIS.

In a study of a Family Medicine Information System (FMIS) in Turkey, respondents reported that improved access to training, enhanced documentation practices for nurses and software upgrades would improve their perception of the system [3]. In this study of the attitudes of health professionals toward an EHR in a primary care setting, nurses reported that the FMIS saved them time, decreased their use of paper, provided better access to data, supported their clinical decision making and made it easier for data transfer. Despite nurses reporting saving time specifically with documentation, nurses still felt the FMIS took more time to utilize than paper-based records, and that their workload was increased. Nurses also worried about the impact the FMIS had on their interaction with other health professionals and patients, as well as the frequent downtimes of the system. Another Turkish study was conducted to understand in-patient nurses' views and satisfaction with an EMR in Ministry of Health, private and university teaching hospitals in Kocaeli [13]. Survey responses showed that a large number of nurses had never been formally trained on how to use the system, and that results of the study may have been different if all nurses had received training. 59% of nurses reported that the EMR was not well integrated into their workflow, and that use only occurred occasionally such as when lab results needed to be found. Nurses who used the system more were more satisfied with their interaction with the EMR, and felt the quality of the information was better. Nurses also reported that the system improved the legibility of patient information and improved patient safety.

Walston and colleagues (2010) investigated potential relationships between information technology (IT) and the visibility of patient care errors in five hospitals in Saudi Arabia [14]. The authors expected to find that the more nurses used the IT system, the lesser the number of patient care errors would be present. A total of 566 nurses responded to the survey and the results supported the authors' hypothesis. It was discussed that hospitals need to encourage staff to report incidents and facilitate a blame-free climate in addition to implementing IT systems to focus on patient safety, and to support quality improvement.

In an Iranian study evaluating the compatibility of an electronic patient record (EPR) system with nurses' management needs, a survey was distributed to head nurses and nursing supervisors [1]. Responses to the survey indicated that over half (57.6%) of head nurses and nursing supervisors used a computer at home, and that those with more experience using a computer had better perceptions of the EPR system in their workplace. Additionally, respondents reported that at the time the information contained within the EPR was not sufficient to meet the information gathering requirements of their roles, and that they were required to seek out other sources of information. In another study conducted in Iran aimed at evaluating the effectiveness of training courses for HIS, doctors, nurses, and medical personnel provided feedback on their use of the system [15]. Respondents feedback was then categorized into the following themes: *software problems*, *hardware problems* e.g. slow computer processing speed, personnel related issues such as users not familiar with using computers, *problems related to the management and supervision*, and *training problems*. The results showed that users of the HIS found the system to have many basic problems, and that continued support e.g. further training, and system improvements may enhance their use of it. The participants

Table 1: Summary of the Research Findings

	Authors & Year of Publication	Country	Definition of Electronic Health Record	Participants	Key Aims	Methods	Important results
1	Agharezaei et al., 2014 [18]	Iran	Computerized clinical decision support system (CDSS): An application that provides information for a safe patient care. It includes evidence-based standards and guidelines, procedures and protocols, regulations and suggestions for care, drug references, calculation instruments, and links to the library database as well as digital and internet references.	Nurses and physicians	To investigate the influence of CDSS on reducing the incidence of pulmonary embolism and deep vein thrombosis, followed by a user survey	Mixed methods: Interviews and survey	• Computer software can assist the medical staff with patient care • The CDSS system contributed to the improved quality of patient care since it sends reminders to physicians and nurses about prophylaxis measures • Nurses and physicians found it helpful to have the computerized system
2	Alasmary et al., 2014 [2]	Saudi Arabia	Electronic medical record (EMR): "An application environment that captures clinical data of patients individually composed with clinical decision support system, computerized order entry and clinical documentation applications"	Nurses and physicians	To explore the relationships between age, occupation, computer literacy, clinical productivity and user satisfaction with the EMR.	Quantitative cross sectional survey	• Nurses with higher computer literacy skills were more satisfied with the system
3	Alghenaimi, 2012 [16]	Oman	Al-Shifa: "The e-health application called Al-Shifa is an in-house health information management system designed by Oman's Ministry of Health"	Nurses	To assess the usefulness and ease of use of Al-Shifa to support the transition of care during nursing handoff	Mixed methods: Survey, interviews, participant observation and artifact analysis	• Older nurses felt the Al-Shifa system was difficult to use at shift hand off • Nurses who felt the system was more useful and easy to use, used it more
4	Alquraini et al., 2007 [4]	Kuwait	Health Information System (HIS): No definition provided	Nurses	1- To analyze the background characteristics that influence nurses' attitudes towards the use of computerized HIS in Kuwaiti government hospitals 2) To assess their level of skills in computer use	Quantitative cross sectional survey	• Respondents generally had positive attitudes toward computerized HIS. • Gender, nationality, education levels, and duration of computer use were statistically significant predictors of attitudes toward computerized HIS.
5	Bahnassy, 2013 [5]	Saudi Arabia	Health Information System (HIS): No definition provided	Nurses	To understand nurses' perceptions of the HIS	Quantitative cross sectional survey	• Nurses spend more time charting on the HIS • Level of education and years of computer experience were significant predictors of satisfaction with use of the HIS
6	Darr et al., 2003 [17]	Israel	Electronic Medical Record (EMR): a computerized system that replaces or supplements "the familiar patient files"	Nurses and Physicians	1-To discover the features and impacts of EMR usage that are most important to physicians and nurses 2- To understand attitudes towards EMR among staff members.	Qualitative utilizing interviews	• Nurses expressed positive reactions to EMRs and its effect on their occupation. • Nurses valued EMRs in that it provided easy access to clinical and socio-economic information.
7	Kahouei et al., 2015 [1]	Iran	Electronic Patient Record (EPR): Electronic systems that store patient information and vary in terms of the specific functions	Supervisors and head nurses	To understand the perceptions of supervisors and head nurses views of the EPR and understand its impact on nursing management functions	Quantitative cross sectional survey	• Due to the low quality of the system, head nurses and supervisors need to seek out additional information • Head nurses and supervisors had a low level of computer literacy and 42.4% did not utilize a computer at home • Head nurses and supervisors with more computer knowledge and experience had better perceptions of computers at work
8	Moghadam & Fayaz-Bakhsh, 2014 [15]	Iran	Hospital Information System (HIS): a computerized system that collects, saves, processes, extracts, and links patient care information to management information	Nurses, Physicians and Allied Health Professionals	To evaluate the effectiveness of training courses for HIS.	Qualitative research utilizing interviews and focus groups	• To achieve the ultimate goal of HISs, it is necessary to create basic changes in the training system, and to get feedback from hospital personnel

9	Saddik & Al-Mansour, 2014 [12]	Saudi Arabia	Computerized Physician Order Entry (CPOE): allows healthcare providers to electronically enter orders (laboratory, medication, imaging etc.) for patient care	Nurses	To explore the perception of nurses regarding the CPOE support on nurse physician communication in the medication order process	Quantitative cross sectional survey	• Almost all nurses perceived that CPOE allowed easier accessibility to patients' medication records and provided complete and legible drug prescriptions. • Most nurses agreed that more physician contact was required with CPOE • There was an increased need to contact the physician via the phone with CPOE
10	Secginli et al., 2014 [3]	Turkey	Family Medicine Information System (FMIS): Documentation platform for health professionals	Nurses, physicians and midwives	To assess the attitudes of health professionals towards the FMIS	Quantitative cross sectional survey	• The majority of respondents felt the FMIS saved them time in documenting, decreased their use of paper, provided better access to data, supports clinical decision making and makes it easy to transfer data • Approximately half of respondents felt the FMIS facilitated communication between health professionals • Respondents felt that the FMIS takes more time than paper-based records, increases workload, was difficult to use, decreases interaction between the health professional and the patient, and has frequent 'down-times'
11	Top et al., 2012 [13]	Turkey	Electronic Medical Record (EMR): Computerized record of clinical, demographic and management information	Nurses	To understand nurses' views of the EMR in terms of use, quality and user satisfaction	Quantitative cross sectional survey	• 59% of respondents felt the EMR was not well integrated into their workflow • Half of the nurses who responded had not been trained to use the EMR • Nurses do not use the EMR often. When they do use the EMR it is most often to retrieve lab results. • Nurses who used the system more often, were more satisfied with the EMR and felt the quality of the information was better
12	Walston et al., 2010 [14]	Saudi Arabia	Information technology (IT): The technology resources employed as the foundation of both communications across the organization and the implementation of present and future business applications.	Nurses	To examine the effects of use of information technology and focus on patient safety and problem solving on the visibility of patient care errors	Quantitative cross sectional survey	• The greater use of information technology to control patient care may reduce the prevalence of errors • An increased focus on patient safety and problem solving facilitates an open environment where errors can be more openly discussed and addressed

also requested a separate system for management functions, and requested clinical decision support functions to be incorporated into the EPR.

One of the studies discovered was a dissertation conducted at the Royal Hospital in Muscat, Oman [16]. Although this study had several aims, one specifically assessed the usefulness and ease of use of an EHR system called 'Al-Shifa' to support the transition of care during nursing handoff. In this study, the doctoral student utilized a mixed methodology inclusive of a survey, interviews, participant observations and artifact analysis. Findings of the study showed that age had a significant relationship on the 'ease of use' of the system. Specifically, older nurses found the 'Al- Shifa' system to be more difficult to use. Additionally, nurses who found the system useful, and easy to use, used the system more frequently.

A study by Darr et al (2003) investigated important features required in an EMR system from the perceptions of physicians and nurses [17]. Eleven senior specialists, seven junior doctors, and eight nurses from five Israeli hospitals were included in the study which was conducted via interviews. The authors learned that nurses' reactions to the EMR were similar to that of senior physicians rather than to junior doctors. Nurses found that EMRs provided easier access to patient information. Interestingly, as nurses were involved in the implementation of the EMR, they believed that the system supported their workflow and therefore their attitudes toward it were positive.

A Kuwaiti study looked at nurses' attitudes towards the use of HIS in government hospitals [4]. 530 out of 574 surveys were completed and returned. Results showed that nurses working in Kuwait had positive attitudes towards computerized health information systems. Higher education, female gender, duration of computer-use, and nationality, influenced more positive attitudes towards HIS for patient care.

Lastly, Agharezaei et al. (2014) investigated attitudes toward a computerized clinical decision support system (CDSS) that aimed to reduce the incidence of pulmonary embolism and venous thrombotic embolisms [18]. Interviews were conducted with software users including nurses and were followed by standardized questionnaires. Users found it helpful to have the electronic system and saw benefits of applying it in their practice to improve patient care. Specifically, nurses found that the prompts provided by the CDSS were helpful to ensure that they provided patients with evidenced based care.

Discussion

Satisfaction and attitude

Many of the studies included in the review focused on nurses' *satisfaction* or *attitude* toward using the particular EHR system [1-6,11]. Since nurses are required to use the technology by their organization, the salience of studying *satisfaction* and *attitude* of nurses toward EHRs may be questioned. However, authors of the studies assessing these concepts argue that there are "diverse effects of nursing satisfaction with the use of HIS in their daily practice" [5], and that nursing satisfaction may be an indicator of how well the system supports nursing work, and has been adopted generally. It is therefore suggested that nurses' satisfaction and attitude toward an EHR system may be a good proxy for its adoption into an organization.

In the reviewed studies, a number of factors that have been shown to influence nurses' satisfaction toward an EHR include a nurses' computer literacy level [2], computer experience [5], level of education [5] and use of the EHR itself [13]. The reviewed studies also show that nurses' attitude toward an EHR may be affected by their gender [4], nationality [4], level of education [4], duration of computer use [1,4] and their knowledge of computers overall [1]. Research conducted in non-Middle Eastern settings has also found similar results [6,19-21]. Additional factors that have been shown in non-Middle Eastern studies to influences nurses' satisfaction or attitudes toward EHRs include age [22], experience as a nurse [21,23] specialty in nursing [19], access to computers [7] and system factors such as its design [24], speed [7] and frequency of downtimes (Weber). Ensuring that nurses are part of the team responsible for a system implementation has also been suggested to improve adoption [25].

Nurses' time

One of the benefits of an EHR to patients may be that more of a nurse's time is spent interacting and providing patients with care, rather than administrative tasks or documentation, as is found in a paper based system [5]. The results of the reviewed studies suggest that when efficiencies in documentation time are gained, nurses may be asked to complete a more enhanced or detailed level of documentation which may then lead to nurses spending even more time documenting than they did with the paper based record [3,5]. Additionally, nurses may be required to double document (on paper and in the EHR), when a system is initially implemented.

A systematic review of the impact of an EHR on time efficiencies of nurses found that bedside terminals rather than centrally located computers allowed nurses to use their time more effectively and efficiently when documenting [26]. Although not examined in the studies included in this review, point-of-care devices such as workstations on wheels that are being implemented in health settings globally may also influence the amount of time nurses spend documenting as they don't have to recall information when entering information into a computer at a fixed location [27]. In the reviewed studies, computers were located in central locations. The opportunity to utilize more portable systems for EHR use and access should be considered in future implementations.

System and setting variability

Seven different terms were utilized for EHR in the studies reviewed. These included Family Medicine Information System [3], Electronic Medical Record [2,13,17], Al-Shifa e-health application [16], Hospital Information System [4,5], Electronic Patient Record [1], Computerized Physician Order Entry [12] and Information Technology [14]. Not only is different terminology used, the systems in themselves may vary considerably. Some of the systems may serve several different functions e.g. *Laboratory results viewing* and *nursing documentation*, whereas others may offer only one function e.g. *computerized physician order entry*. Given that a broad search was conducted, these findings are not surprising. However, given the heterogeneity of the EHR configurations, how nurses interacted with these systems is unknown. It therefore remains unclear if nurses are expected to document and contribute information to all of these systems, or to utilize some of the systems to simply extract information. This lack of clarity renders the findings of the studies less generalizable, and perhaps less valuable to other organizations within Middle Eastern countries who may wish to apply the lessons learned from the studies to their particular situation.

Further Research

Although nurses have used computers in the Middle East for many years, nursing research with a focus on EHRs in this region is relatively new. Thus, it was not surprising to find only twelve studies focusing on this topic. However, there are many EHR systems that have been implemented, or are currently being implemented in the region, and therefore nursing research that aims to evaluate how best these systems can be implemented to support nursing practice would be valuable. Although nurses' satisfaction with and attitudes towards EHRs may be an important indicator of how well the technology supports nurses, a more comprehensive evaluation of system implementations is encouraged. As past literature has also suggested, organizations wishing to adopt such technology may want to understand barriers to successful adoption, and how these barriers may be best addressed [25]. The middle-east is a unique region in which language, infrastructure, a large expatriate population in some countries, and other important factors may influence nurses' use of the technology. As such, research that seeks to identify the unique barriers and facilitators to EHR use by nurses, as well as interventions or support mechanisms integral to a successful implementation may be valuable.

Conclusion

In conclusion, this literature review showed that despite the large number of technology implementations in the region, little research has been conducted to understand the intricacies of adoption unique to the region. Saudi Arabia had the most publications whereas countries such as Qatar or the United Arab Emirates had no publications. Findings from the twelve studies that were completed showed there is great variability in the systems and settings in which EHRs are implemented. Further training was the most common suggestion to support nurses' use of EHRs. Although nurses' attitudes towards the systems are generally positive, further research may identify more effective and efficient ways to enhance nurses' adoption of the technology.

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