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Factors Influencing the Utilization and Adoption of Electronic Health Records among Nurses in Jordanian Hospitals

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ABSTRACT

Background: The utilization of electronic-health-record (EHR) systems within the nursing profession plays a crucial role in maintaining patient privacy and confidentiality, ensuring the provision of high-quality and accurate documentation, enhancing communication, and reducing the overall cost of care. By examining the various factors that influence nurses' adoption and utilization of EHRs and evaluating the effectiveness of this technology, we can reduce any potential negative impacts on patients and healthcare staff. ***Purpose:*** This study aimed to explore and analyze the various factors influencing the utilization and adoption of electronic health records (EHRs) among nurses in Jordanian hospitals. ***Methods:*** In this study, a cross-sectional correlation descriptive design was utilized. The researchers employed a convenience sampling technique to select a total of 373 nurses who regularly use electronic health records (EHRs) in their work settings. The data for the study was collected from two major healthcare sectors in Jordan, specifically military hospitals and governmental hospitals. A structured electronic survey was administered to gather the necessary information. ***Results:*** Out of 373 nurses, 216 (57.9%) were from military hospitals, and 157 (42.1%) were from governmental hospitals. The sample included 201 females (53.9%) and 172 males (46.1%). The study found that system quality, information quality, and self-efficacy are positively correlated with EHR usage. System quality was a significant predictor of EHR usage ($\beta = 0.41$, $p = 0.043$). Nurses in the military sector used EHRs more than those in governmental hospitals ($t = 1.97$, $p = 0.05$). Nurses with bachelor's degree exhibited higher electronic health record (EHR) usage compared to nurses with other academic levels ($F = 7.98$, $p < 0.001$). Nurses on 12-hour night shifts also had a higher EHR usage than nurses in morning shifts ($F= 3.50$, $p < 0.05$). Furthermore, the duration of EHR use was positively correlated with system quality, information quality, self-efficacy, and work settings, while age and gender had no significant impacts on EHR usage. ***Conclusion*:** Several factors were found to be significant concerning the system itself, such as system quality and information quality. Additionally, self-efficacy was found to have a positive correlation with EHR usage. Nurses play a crucial role in identifying these factors. It is important to identify these factors to guide hospital administrations in improving their policies, specifically in terms of enhancing training and promoting the use of electronic health records (EHRs) by nurses during patient care. ***Implications for Nursing*:** The findings highlight the importance of system quality, self-efficacy, and educational level in promoting effective EHR use. To enhance EHR adoption, healthcare organizations should focus on improving system quality and providing targeted training, particularly for nurses with lower education levels. Additionally, addressing shift-specific challenges, such as those faced by night shift nurses, could further optimize EHR usage. These insights can guide hospital managements in refining policies and supporting nurses, ultimately improving patient care and operational efficiency.

Keywords: Health information system, Health technology, Nurses, Electronic health records, Jordan.

What does this paper add?

1. This study identifies the key factors affecting nurses' utilization and adoption of electronic health records, including system quality and self-efficacy.
2. This study highlights differences in EHR usage between military and governmental healthcare sectors, suggesting that the organizational context may influence technology adoption and provide a basis for sector-specific strategies.
3. The findings emphasize the role of educational qualification in EHR utilization, indicating that nurses with higher education levels are more proficient in using EHR systems. This underscores the need for targeted training programs, especially for nurses with lower educational backgrounds.
4. The study reveals that working shifts, particularly the 12-hour night shift, significantly affect EHR usage, suggesting that staffing patterns and shift structures may need to be reconsidered to optimize technology use.

Introduction

Background of EHR Development

The Electronic Health Record (EHR) was first introduced in the mid-1960s with a focus on managing data. A significant milestone in the development of EHRs was the creation of Problem-Oriented Medical Records (POMR) by Dr. Lawrence Weed in 1968. The goal of POMR was to transform the traditional stream-of-consciousness style of record-keeping into a format that could still be utilized in certain healthcare sectors. In 1972, the Regenstreif Institute in Indianapolis and Clement McDonald developed the first Electronic Health Record (EHR) system. This groundbreaking system aimed to create a database system that would assist clinicians and address issues related to database design. Then, during the 1990s, personal computers became more affordable, and internet networks began to emerge (American Health Information Management Association, 1992; Evans, 2016; Jacobs, 2009; Meier-Diedrich et al., 2023; Regan, 1991). These advancements allowed for easier and faster access to online information. In response to the growing use of EHRs, the Health Insurance Portability and Accountability Act (HIPAA) was introduced in 1996. HIPAA was designed to ensure privacy, security, and confidentiality of healthcare information. In the early 2000s, a new generation of EHRs was developed. After that, by 2015, the United States government began implementing penalties on healthcare organizations that did not maintain electronic medical records (Fernández-Alemán et al., 2013; Takyi, 2019).

EHRs in Jordan and Hakeem Program

In Jordan, there has been actively pursuing global development in the healthcare sector. To support this endeavor, Electronic Health Solutions (EHSs) were established in the early months of 2009. The primary objective of EHSs was to propel the healthcare industry in Jordan forward (Sharikh et al., 2020). EHRs operate as an innovative, technology-driven, privately-owned, non-profit organization, which offers automated solutions aimed at enhancing the quality and efficiency of public healthcare services in Jordan (Klaib & Nuser, 2019). In recent times, telemedicine has emerged in the healthcare sector. Additionally, new legislations have been introduced to legalize certain medical practices. Furthermore, prominent companies have introduced innovative technology, enabling patients to access their health records through smartphones. The implementation of EHRs has been widespread across numerous countries, driven by the growing demand for advanced healthcare services and the availability of modern technology (Anawade et al., 2024; Haleem et al., 2021).

Hakeem program is a software designed to improve healthcare development by storing patient files electronically, making them easily accessible to users based on their national identification number (Aldiqs & Ahmad, 2023; Jalghoum & Khasawneh, 2016). This program is the first of its kind in Jordan and aims to enhance the quality of healthcare services while maintaining the privacy and safety of patient information. Additionally, it aims to connect public health services in Jordan (Klaib & Nuser, 2019). Hakeem program includes various applications, such as administration, laboratory and radiology, pharmacology, documentation, physicians' order

systems, and billing systems (Klaib & Nuser, 2019). The program was initially introduced in the Ministry of Health (MOH) in 2012 and quickly spread to other facilities by 2014. Currently, Hakeem program is implemented in 196 health facilities, including hospitals, primary care centers, and comprehensive health centers, accounting for 77% of beds in the public health sector. Over seven million electronic records are stored in the program, and it is utilized by more than 30,000 users, including physicians, nurses, pharmacists, and technicians (Aljaafreh, 2020).

Advantages and Benefits of EHRs

The utilization of EHR systems offers numerous advantages. One of the main benefits is the ability to securely store and exchange patients' information, ensuring its safety and confidentiality. This not only maintains privacy, but also facilitates high-quality data by reducing errors (Benedictis et al., 2020). Additionally, EHRs improve healthcare services and reduce treatment costs by saving time and money for healthcare professionals and organizations. They also enhance communication and interaction between patients and healthcare providers, as well as among healthcare providers themselves (Benedictis et al., 2020; Keshta & Odeh, 2020). EHRs are designed to provide a consolidated record that can store a large amount of data for each individual. Moreover, they facilitate safe and secure interdisciplinary communication among the healthcare professional team (Ozair et al., 2015). The use of EHRs has demonstrated a positive impact on the quality of healthcare provided compared to other methods in Jordan (Ayaad et al., 2019).

Challenges in EHR Implementation

The successful implementation of EHRs has been hindered by numerous challenges, despite their potential to improve healthcare delivery and patient outcomes. To illustrate, previous studies have identified common barriers that impact EHR adoption, focusing on both technical and human factors. Ajami and Arab-Chadegani (2013) conducted a systematic review of the barriers to EHR implementation, revealing that resistance to change is one of the most significant obstacles. This resistance, both at the individual and organizational levels, arises from fears about the complexity of new systems, the disruption of established workflows, and concerns about data security. Similarly, cost constraints and technical limitations were identified as key barriers, making the implementation process challenging, particularly in resource-limited settings. Furthermore, these findings were expanded by a scoping review of EHR implementation and adoption, which included 142 studies published between 2005 and 2020. They identified resource constraints and insufficient training as recurring issues that prevent effective EHR use. Many healthcare professionals struggle with poor technical support and lack of adequate educational resources, which undermine their ability to effectively integrate EHR systems into their practices. Furthermore, poor technology literacy among healthcare providers often exacerbates these challenges, leading to underutilization of EHR systems despite their availability. Moreover, it was pointed out that lack of standardization and inconsistent EHR definitions are factors that complicate the adoption process, leading to fragmentation in system usage and creating barriers to system interoperability. It was agreed that overcoming these barriers requires targeted interventions, including better training programs, more comprehensive technical support, and organizational change management to address resistance and facilitate smoother transitions to EHR systems.

EHR Implementation in Jordan: Evaluation and Barriers

In Jordan, a previous study was conducted to evaluate the success of Hakeem Electronic Health Record (EHR) system, particularly its implementation in one of Jordanian governmental hospitals. The primary objective was to develop a comprehensive evaluation model for EHR systems by integrating Delone and McLean's Information System Success Model with the Balanced Scorecard framework. A triangulation approach, combining qualitative and quantitative methods, was employed, using interviews and questionnaires to gather data. The findings indicated that the internal perspectives from both models played a significant role in determining the success of Hakeem. Furthermore, the interactions between these perspectives were found to be essential in enhancing the system effectiveness. The study proposed an integrated evaluation model that can be applied to assess the success of EHR systems in other settings. The authors also suggested that future research should investigate external factors, such as political, economic, and

technological influences on EHR adoption and success (Othman & Hayajneh, 2015).

Furthermore, another study investigated the challenges facing e-health development in Jordan, focusing on healthcare providers' perceptions. Based on 26 semi-structured interviews, key challenges identified include lack of regulations, insufficient financial resources, privacy concerns, and issues related to the healthcare sector's nature. The findings underscored the significant role of human and cultural factors in hindering progress. To address these barriers, the study recommended implementing supportive laws and policies, securing necessary funding, addressing privacy issues, and standardizing e-health systems. These insights are valuable for decision-makers in advancing e-health initiatives in Jordan (Jalghoum et al., 2021).

However, in Jordan, there is a significant gap in the literature when it comes to understanding the factors that influence the use of electronic health records (EHRs) by nurses in Jordan. This lack of knowledge limits our ability to predict these factors accurately, find solutions to mitigate their impact on users, and effectively evaluate the success of information system (IS) implementation. Thus, in this study, the researchers aimed to explore the impact of training, system quality, service quality, information quality, self-efficacy, net benefits, and users' satisfaction on the utilization of EHRs by nurses. Furthermore, the study sought to investigate the connection between socio-demographic data and the use of EHR systems**.**

Research Aims

This study aimed to explore and analyze the various factors that influence the utilization and adoption of electronic health records (EHRs) by nurses in Jordan. By delving into these factors, the study aimed to provide a comprehensive understanding of the challenges and barriers that nurses encounter when adopting and using EHR systems in their daily healthcare practices.

Methods

Research Design

To accomplish the objectives of this study, a cross-sectional correlation descriptive design was implemented. This design was selected, as it enables researchers to observe and analyze the relationships between variables at a specific point of time. By utilizing this design, the researchers aimed to gather comprehensive information and establish correlations between various factors influencing the use of EHR systems by nurses in Jordanian hospitals.

Setting and Sample

The eligible participants for this study were nurses who were using electronic health records (EHRs) and could read and write in English. To determine the appropriate sample size, G* Power software was utilized, taking into consideration a medium effect size of 0.3, an α (significance level) of 0.05, and a power of 0.80. This calculation indicated that a sample size of 335 nurses was necessary to obtain statistically significant results. To account for potential attrition and ensure an adequate sample size, 450 nurses were initially approached for participation in the study. Ultimately, a total of 373 nurses were conveniently recruited and included in the study. Data was collected from two large hospitals in Jordan, specifically a military hospital and a governmental hospital. These hospitals were chosen, because they represent a significant portion of the nursing workforce in Jordan.

Data Collection

The researchers obtained permission from the hospitals that were chosen for the study. They then created a comprehensive list of all the nurses working in these hospitals and managed the recruitment process through either in-person appointments or e-mail communication. Before participating in the survey, all participants were provided with informed consent, which included an introduction explaining the purpose of the research, the eligibility criteria for participation, assurance of confidentiality, and instructions for completing the survey. It was estimated that it would take participants approximately 10-15 minutes to complete the questionnaire. Additionally, the authors of the study were available to address any questions or concerns that participants may had.

Instrument

In this research, the investigator utilized the Electronic Health Record (EHR) system success measurement scale. This scale was originally developed by Ping Yu and Siyu Qian. Permission was obtained from the original authors through e-mail correspondence. This scale consists of two distinct parts. The first part encompasses a set of 23 items that serve

various purposes. For instance, items 1-4 are designed to assess the quality of the system, while items 5-8 focus on evaluating the information quality. Additionally, item 9 measures user satisfaction, items 10-11 measure self-efficacy, items 12-14 measure service quality, and items 15-18 measure training. Finally, items 19-23 are specifically devised to evaluate the net benefits derived from utilizing the EHR system. A Likert scale, which ranged from 0 to 7, was used to rate responses. On this scale, a rating of 0 means don't know, while a rating of 1 means strongly disagree. A rating of 2 indicated a disagreement, while a rating of 3 indicated a slight disagreement. A rating of 4 denoted neutrality, while a rating of 5 indicated a slight agreement. A rating of 6 meant an agreement, while a rating of 7 signified a strong agreement.

The second part of the scale focuses on gathering demographic information and measuring the EHR use by asking three specific questions: Question 1 was worded as 'How many minutes per shift do you spend on the system?', question 2 was 'How many times a shift do you log into the system?', and question 3 was 'How many functions in the system have you used?'. This part contains a total of fourteen items, with three items specifically assessing the nurses' EHR use and the remaining eleven items measuring various characteristics, such as age, gender, job role, work shift, educational level, and years of experience.

Ethical Considerations

Ethical approval was obtained from the hospitals that were selected for this study, and specific approval numbers were assigned: the military hospital received the number 7-2020-29, while the governmental hospital was assigned MOH-REC-2020-126.In addition, it is important to note that all participants in this study had the right to withdraw from the study at any time. To ensure the privacy and confidentiality of the participants, data collection was conducted in a way that did not involve any personal identifiers, such as user names or e-mail addresses. Furthermore, the survey responses were not linked to any individual's name. The collected data was treated with the utmost confidentiality and was compiled and stored securely using a password-protected Microsoft form spreadsheet and a computer with a password. Only the researchers had access to this data. Lastly, it is worth mentioning that the data presented in this study was completely anonymous, both in terms of the hospitals involved and the participants.

Data Analysis

The data was carefully examined through both descriptive and inferential statistical analysis. Descriptive statistics (frequency, means, and standard deviations) were calculated for sample characteristics. The collected data was organized and summarized through coding and tabulation. To conduct the analysis, the Statistical Package for Social Sciences (SPSS), IBM, version 26 was used. Furthermore, to achieve the study aims, multiple statistical tests were used, including linear regression, analysis of variance (including T-test and ANOVA), and Pearson's r correlation.

Results

Demographic Data and Participant' Characteristics

The final analysis reveals that more than a half of the participants, approximately 57.9%, were from the military healthcare sector. Among these, 98 individuals were males, while 118 were females. On the other hand, the remaining 42.1% were affiliated with the governmental healthcare sector, being 74 males and 83 females. When considering the professional licenses of the participants, it was found that the majority, approximately 84.5%, were registered nurses. In terms of their work settings, about 37.9% of the nurses were employed in critical care units, while 24.1% worked in medical-surgical departments. A smaller percentage, 7.5%, were found to be working in emergency departments and 9.6% were employed in operation rooms.

In terms of work shift, the majority of participants, specifically 60.3%, worked on the morning shift. 15.3% worked on the afternoon shift, while 8.8% worked on the night shift. Additionally, 8.3% worked on a 12-hour day shift and 7.2% worked on a 12-hour night shift. The participants had been working at their current hospitals for varying lengths of time, ranging from 1 year to 30 years (M=8.48). They had also been using electronic health records for different durations, ranging from 1 month to 84 months (M=27.7, SD = 18.49). In terms of their overall experience, the participants had between 1 and 30 years of experience (M=10.8, SD= 5.52). Regarding the EHR system, the nurses used it for different functions, ranging from 1 to 9 times (M= 4.36).

The number of times users logged into the EHR

system varied greatly, ranging from 0 to 360 login times (M=12.55). Similarly, the amount of time spent using the EHR system also varied, with users spending from 0 to 360 minutes (M = 83.6) during a single shift. When examining the functions utilized within the EHR system, it was found that the progress note was the most commonly used by nurses, accounting for 79% of usage. Following this, patient details were utilized in 228 instances, or 61% of usage. In contrast, the upload photo feature was the least frequently used, with only 15% of usage.

Table 1. Participants' characteristics and EHR use (N=373)

Characteristics	**N (%)**	**M ± SD**
Gender		
Male	172 (46.1%)	-
Female	201(53.9%)	-
Age	-	32.81 ± 5.91
Type of hospital	-	
Governmental	157 (42.1%)	-
Military	216 (57.9%)	-
Level of education		
Diploma	28 (7.5%)	-
Bachelor	302 (81%)	-
High diploma	5 (1.3 %)	-
Master/PhD	38 (10.2 %)	-
Employment		
Associate nurse	24 (6.4%)	-
Registered nurse	315 (84.5 %)	-
Manager/Director	25 (6.7 %)	-
Others	9 (2.4%)	-
Current working area		
Adult medical/surgical	66 (17.7%)	-
Pediatric medical/surgical	24 (6.4%)	-
Adult critical care unit	113 (30.4%)	-
Pediatric critical unit	28 (7.5 %)	-
Emergency department	28 (7.5 %)	-
Operation rooms	37 (9.6%)	-
Outpatient clinic	21 (5.6%)	-
Others	56 (15.3%)	-
Work shift		
Morning shift	225 (60.3%)	-
Afternoon shift	57 (15.3%)	-
Night shift	33 (8.8%)	-
12-hour day shift	31 (8.3%)	-
12-hour night shift	27 (7.2%)	-
Years of experiences	-	10.77 ± 5.53
Duration of using EHR/Month	-	27.73 ± 18.49
Number of functions used by nurses	-	4.36 ± 2.55
Times of login into systems	-	12.55 ± 25.18
Duration of using EHR system/shift [minutes]	-	83.66 ± 71.19
Note: M= Mean. SD = Standard Deviation EHR: Electronic Health record.		

Factors Influencing the Use of Electronic Health Records among Nurses

To identify the factors that influence the utilization of an EHR system, a multi-variable linear regression analysis was conducted, considering various independent variables, such as system quality, information quality, user satisfaction, self-efficacy, service quality, training, and net benefit. The results of the analysis revealed a statistically significant impact on the use of the EHR system ($p = 0.050$, R square = 0.037), indicating that 3.7% of the utilization can be explained by the variables included in the scale. Notably, only system quality demonstrated a significant influence on the utilization of the EHR system, whereas the other factors did not show any statistical significance. These findings are summarized in Table 2, where it can be observed that system quality had a positive effect on the use of the EHR system ($b = 0.409$, $p = 0.043$).

Table 2. Multi-variable linear regression analysis of factors that affect the use of the EHR system by nurses in Jordan

Variable	β	SE	*t*	P value	CI
System quality	0.409	0.202	2.031	0.043	0.013 - 0.806
Information quality	0.124	0.191	0.652	0.515	-0.251 - 0.500
User satisfaction	-0.115	0.143	-0.801	0.424	-0.396 - 0.167
Self-efficacy	0.090	0.170	0.531	0.596	-0.244 - 0.425
Service quality	-0.167	0.194	-0.860	0.390	-0.549 - 0.215
Training	-0.014	0.162	-0.088	0.930	-0.333 - 0.305
Net benefit	-0.027	0.164	-0.167	0.867	-0.350 - 0.295
Note: CI= 95% Confidence Interval. SE= Standard Error.					

Differences in EHR Use Based on Participants' Characteristics

An independent t-test was performed to investigate the difference in EHR system utilization according to gender and health sector. The analysis revealed that there was no statistically significant difference between genders in terms of their use of EHR systems ($t = 1.31$, $p > 0.05$).

An independent t-test was performed to investigate the disparity in the utilization of Electronic Health Record (EHR) systems between the two health sectors. The results of this study also revealed a statistically significant difference in the average usage of EHR systems between nurses affiliated with military hospitals and those affiliated with governmental hospitals ($t = 1.97$, $df = 317$, $p = 0.05$). These findings indicate that the observed difference in the mean usage of EHR systems between the two groups is statistically significant. Additionally, the effect size of the difference was measured to be 0.20, suggesting a small effect. This implies that a significant difference was observed in the utilization of EHR systems between military and government-affiliated nurses.

To examine the variations in the utilization of EHR systems by nurses based on their educational levels, a one-way analysis of variance (ANOVA) was carried out. The results showed a significant distinction in the usage of EHR systems among nurses with different educational backgrounds ($F = 7.983$, $p<0.001$). To determine the significance of differences, *post-hoc* comparisons were conducted using the least significant difference (LSD) test. These comparisons revealed that the average number of EHR system usage was significantly associated with nurses holding a bachelor's degree ($M = 4.599$, $SD = 2.561$).

To investigate whether there is a variation in the utilization of EHR systems by nurses based on their working shifts, a one-way analysis of variance (ANOVA) was conducted. The results indicated a statistically significant difference in the use of EHR systems among the five different working shifts ($F = 3.503$, $p<0.05$). To further examine the significance of differences, *post-hoc* comparisons using the LSD test were performed. These comparisons revealed that the average number of EHR system usage during the 12-hour night shift ($M = 5.481$, $SD = 2.486$) was primarily responsible for the observed effects.

Table 3. T-test for the difference in the use of EHR systems according to participants' characteristics

	N	M ± SD	*F or t*	p-value
Gender				>.050
Male	172	4.17 ± 2.59		
Female	201	4.52 ± 2.52		
Health sector			1.970	=0.050
Governmental	157	4.057 ± 2.562		
Military	216	4.583 ± 2.534		
Level of education			7.983	<0.001
Diploma	28	2.250 ±1.294		
Bachelor	302	4.599 ±2.561		
Higher Diploma	5	3.400 ±3.361		
Master/PhD	38	4.158 ±2.422		
Working shift			3.503	<0.05
Morning	225	3.991±2.483		
Afternoon	57	4.895±2.710		
Night	33	4.697±2.615		
12-hour day shift	31	4.742±2.366		
12-hour night shift	27	5.481±2.486		

Relationships between Several Independent Variables and the Use of EHR systems

In Table 4, the relationships between various factors, such as system quality, information quality, user satisfaction, self-efficacy, service quality, training, net benefit, and the use of EHR systems were examined. The results show that there is a strong positive association between the quality of the system and the utilization of EHR systems. Additionally, it was found that both information quality and self-efficacy of users also have significant positive impacts on their adoption of EHR systems. However, the remaining correlations between these factors were not found to be statistically significant.

Table 4. The correlation between research variables (system quality, information quality, user satisfaction, self-efficacy, service quality, training, net benefit) and use (N=373)

Variables	System Quality	Information Quality	User Satisfaction	Self-efficacy	Service Quality	Training	Net Benefit
EHR Use	<0.001**	< 0.001**	0.06	0.03*	0.09	0.06	0.12

* Correlation is significant at the p< 0.05 level. **Correlation is significant at the p< 0.01 level. NS: Not Significant. EHR: Electronic Health Record.

Discussion

It is crucial to assess the factors influencing the usage of electronic health records (EHRs) among nurses to minimize any potential adverse effects on both patients and staff. Additionally, evaluating these factors provides decision-makers with precise information that can be utilized for the development of EHR systems (Cucciniello et al., 2015; Yu & Qian, 2018). The incorporation of EHRs is intended to aid nurses in delivering high-quality nursing care and conducting research using real-time data, thereby facilitating improvement and the implementation of evidence-based practices (Bowles et al., 2015). As a result, this study aimed to explore and analyze the various factors that influence the utilization of electronic health records (EHRs) by nurses in Jordan. By delving into these factors, the study aimed to provide a comprehensive understanding of the challenges and barriers that nurses encounter when adopting and using EHR systems in their daily healthcare practices.

Due to the rapid advancement of technology, the utilization and popularity of electronic methods for storing health information have significantly increased for health organizations. This enables them to effectively save patient information and securely exchange it among all healthcare professionals (Evans, 2016). The introduction of electronic health records has revolutionized the management and storage of patient data, transitioning it from traditional paper forms to digital formats. This centralizes the patients' data in one location, making it easily accessible and facilitating safe exchange between healthcare professionals (Evans, 2016). The implementation of EHRs has a notable impact on healthcare services for both patients and individuals (Ayaad et al., 2019).

The Associations between EHR Use and Several Participants' Characteristics

The findings of our study indicate that there is no correlation between the age of nurses and their utilization of electronic health record (EHR) systems. This is consistent with a previous study conducted in Malawi, which aimed to examine the factors influencing the use of EHR systems. The results of that study revealed that neither age nor gender had any impact on the adoption of EHR systems (Khwima et al., 2017). However, our findings contradict those of a prior cross-sectional study conducted in Saudi Arabia, which sought to evaluate the adoption of EHR systems in three governmental hospitals. In that study, it was found that younger nurses were the most frequent users of EHR systems (Mahalli, 2015).

In terms of participants' affiliations, the results of this study indicate that there were notable differences between military nurses and governmental nurses in terms of their use of EHR systems. Specifically, the 216 military nurses who participated in the study demonstrated significantly a higher usage of EHR systems compared to the 157 governmental nurses. However, it is important to note that these findings cannot be generalized to the entire population, as there has been limited research conducted on this topic in Jordan. Additionally, the sample of this study only included selected hospitals in Jordan. However, a study conducted in Iran to evaluate the maturity of electronic medical systems in civilian and military hospitals found that both types of hospitals had similar levels of maturity in terms of EHR adoption (Ahn et al., 2016).

System Quality and EHR Use

The findings of the study indicated that there is an association between system quality and the utilization of Electronic Health Record (EHR) systems. Specifically, it was observed that the effectiveness and efficiency of the system had notable impacts on the extent to which healthcare professionals make use of EHR systems. Thus, based on this finding, improvements in system quality could significantly increase the utilization of EHR systems. This implies that healthcare organizations should prioritize enhancing the quality of their EHR systems to promote their usage among professionals. In consistence with this result, the characteristics of the system quality have been found to have a beneficial impact on the performance of healthcare providers, as they contribute to ease of use and effectiveness. This has been supported by various studies (Aldosari et al., 2018; Salleh et al., 2016). In addition, the results of this study were corroborated by the findings of several other studies, which also demonstrated that greater ease of use and perceived usefulness of the electronic health record (EHR) system were associated with increased adoption rates (Aldosari et al., 2018; Hsiao et al., 2011; Yu & Qiam, 2018). These additional studies provided further evidence supporting the notion that when the EHR system is easier to navigate and perceived as beneficial, healthcare providers are more likely to embrace and integrate it into their practices.

Information Quality and EHR Use

The findings of the study indicate that there is a significant correlation between the quality of information and the adoption and utilization of EHR systems. This finding is consistent with the findings of a previous study conducted in four hospitals in Turkey aimed to explore the use of EHRs by nurses, specifically focusing on nursing care management, information quality, information management, and service quality (Top et al., 2013). Similar to this study, it was discovered that accuracy, reliability, timeliness, completeness, and relevancy were identified as the most important attributes concerning EHR use by nurses (Asi & Williams, 2018). However, in contrast to these findings, another study (Yu & Qiam, 2018) concluded that there was no significant relationship between information quality and the utilization of EHR systems.

Self-efficacy, Training, User Satisfaction, and the Use of EHRs

The results of this study demonstrated a significant correlation between self-efficacy and the utilization of EHRs among nurses in Jordan. This implies that nurses in Jordan who possess confidence and feel at ease when using EHR systems are more likely to use them effectively in their work. This finding aligns with previous research (Hsiao et al., 2011; Yu & Qiam, 2018), who also observed a positive association between self-efficacy and EHR use. Furthermore, when considering the aspect of training and its impact on the utilization of EHR systems, it is crucial to acknowledge the findings of this particular study, which revealed no substantial correlation between training and the utilization of EHR systems. However, it is worth noting that another study carried out in Jordan presented a contrasting perspective, highlighting that the absence or insufficiency of training was identified as a significant obstacle in the adoption and usage of EHR systems (Al-Rawajfaha & Tubaishat, 2019).

The findings of this study indicated that users were generally satisfied with their perceptions of EHR systems. However, it is important to note that these results did not demonstrate any association or impact on the actual use of EHR systems, as observed in previous research (Yu & Qiam, 2018). This discrepancy can be attributed to the fact that EHR systems are often mandatory in public health sectors, and therefore, individuals' perceptions may not necessarily align with their personal experiences or usage of the systems.

Service Quality and the Utilization of EHRs

The results of the study revealed that the quality of service did not have a significant impact on the utilization of EHR systems by nurses, which aligns with the findings of a previous study (Tilahun et al., 2015). This suggests that it is crucial to engage nurses in the process of designing, implementing, planning, and possessing EHR systems. By doing so, it is possible to provide the necessary support and improve the utilization of these systems by nurses through the development of a suitable infrastructure design.

Net Benefits and the Utilization of EHRs

The results of the study indicated that there was no statistically significant association between the use of EHR systems and the overall benefits for nurses. This suggests that the use of EHR systems is still relatively new in Jordan, and as a result, nurses may not fully understand its potential advantages. However, a previous study conducted in Jordan (Tubishat, 2017) found that nurses perceived EHR systems to be highly useful, with perceived usefulness accounting for 51.3% of the variation in their intention to use EHR systems ($p<0.001$). This indicates that the perceived usefulness of EHR systems influences their adoption and utilization. Given these findings, it is recommended that hospital administrators and system developers implement effective and ongoing workshops and education programs to enhance nurses' familiarity and comfort with using EHR systems.

Limitations of the Study

Despite that this is the first study in Jordan to explore various factors influencing the adoption of electronic health record (EHR) systems by nurses, it is important to acknowledge certain limitations. Firstly, there is a potential for bias due to the utilization of convenience sampling techniques. Secondly, the employment of a cross-sectional correlation design permits the examination of relationships between variables, but it restricts the ability to establish causality.

Implications for Nursing

In the context of nursing practice, the findings of this study hold significant importance in the field, as they contribute to the existing knowledge on the factors influencing the utilization of EHR systems by nurses in Jordan. Nurses play a crucial role in patient care and documentation, making them the largest group of healthcare professionals involved in the use of EHR systems. By utilizing EHR systems, nurses can offer a high standard of care, improve the quality of services provided, and ensure patient safety and privacy. Moreover, the predictors identified in this study can greatly benefit nurses in their practice. By assessing these indicators, nurses can ensure the maintenance and provision of secure patient data, leading to a reduction in healthcare costs in Jordan. Additionally, the utilization of EHR systems by nurses will be enhanced, resulting in increased user satisfaction. This, in turn, will improve nursing documentation and enhance communication within the healthcare team.

At the administration level, it is important for healthcare institutions, policy-makers, and system

developers to have a thorough understanding of the various factors that impact the utilization of EHR systems, as well as the specific traits and characteristics of the users. This knowledge is crucial in ensuring that the use of EHR systems is appropriate and effective, ultimately leading to improved patient care and health outcomes. Furthermore, it is beneficial to establish new strategies and plans to optimize the use of EHR systems. This may involve exploring innovative approaches, such as incorporating new technologies or integrating additional features into the existing EHR systems. By continuously evaluating and improving EHR systems, healthcare institutions can ensure that they remain up-to-date and align with the evolving needs and demands of the healthcare industry. To maximize the benefits of using EHR systems, it is advisable to implement a well-designed training program specifically tailored for nurses who will be utilizing these systems. By providing comprehensive training, nurses will be equipped with the necessary skills and knowledge to effectively navigate and utilize EHR systems. Additionally, it is essential to actively involve nursing professionals in the development and updating of EHR programs, as their input and insights can greatly contribute to the overall effectiveness and efficiency of these systems. Regularly modifying and updating EHR systems based on feedback from nursing professionals can further enhance their usability and functionality. In conclusion, a comprehensive understanding of the factors influencing the use of EHR systems and the characteristics of the users is crucial for healthcare institutions, policy-makers, and system developers. By implementing a well-planned training program, involving nursing professionals in the development and updating of EHR programs, and continuously optimizing the use of these systems, healthcare organizations can enhance the implications and benefits of utilizing EHR systems in patient care.

In the realm of research, the discoveries derived from this particular study have the potential to guide other researchers toward the creation of innovative tools and instruments that can effectively evaluate the effectiveness and impact of existing policies and training programs that have been put into practice. By conducting thorough and comprehensive investigations and implementing targeted interventions, it becomes possible to delve deeper into the various factors that are intricately linked to the Jordanian culture and the environmental conditions prevalent in different workplace settings. Furthermore, the utilization of alternative research methodologies, such as qualitative methods, can offer valuable insights and perspectives in order to enhance the overall understanding and interpretation of the data collected.

Conclusion

The findings of the current study indicate that certain factors have significant influences on the use of electronic health record (EHR) systems. These factors include the quality of the system itself, the quality of information provided by the system, and the self-efficacy of the users. Additionally, the level of education (specifically a bachelor's degree), the shift of work (specifically a 12-hour night shift), and the specific health sector (specifically the military sector) were found to have significant impacts on the use of EHR systems among nurses. On the other hand, other administrative factors, such as training, service quality, and net benefits were not found to have statistically significant relationships with the use of EHR systems. These findings suggest that healthcare institutions, policy-makers, and system developers must take into account these factors that may affect the use of EHR systems. It is important to consider the characteristics of the users as well, to ensure that EHR systems are used appropriately and effectively.

Conflict of Interests

The researchers declare no known or potential conflict of interests with respect to the research, authorship, and/or publication of this article.

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