



# Jordanian nurses' attitudes toward using electronic health records during COVID-19 pandemic

## Using EHRs During COVID-19 in Jordan

Walaa H. Abed<sup>a</sup>, Ghada M. Abu Shosha<sup>a</sup>, Islam A. Oweidat<sup>a</sup>, Rafat I. Saleh<sup>b</sup>, Abdulqadir J. Nashwan<sup>c,\*</sup>

<sup>a</sup> Faculty of Nursing, Zarqa University, Zarqa, Jordan

<sup>b</sup> General Hospital, King Saud Medical City, Riyadh, Saudi Arabia

<sup>c</sup> Nursing Department, Hamad Medical Corporation, Doha, Qatar

### ARTICLE INFO

#### Keywords:

Electronic health records  
COVID-19  
Attitudes  
Nurses  
Jordan

### ABSTRACT

Electronic health records (EHRs) have proven their effectiveness during the coronavirus disease (COVID-19) pandemic. However, successful implementation of EHRs requires assessing nurses' attitudes as they are considered the first line in providing direct care for patients. This study assessed Jordanian nurses' attitudes and examined factors that affect nurses' attitudes toward using EHRs. A cross-sectional, correlational design was used. A convenient sample of 130 nurses was recruited from three major public hospitals in Jordan. All Participants completed the Nurses' attitudes Towards Computerization (NATC) Questionnaire. The overall nurses' attitude was positive; the mean was 61.85 (SD = 10.97). Findings revealed no significant relationship between nurses' attitudes toward using EHRs and nurses' age, gender, education level, previous computer skills experience, years of work experience, and years of dealing with EHRs. However, the work unit was found to have a significant correlation with nurses' attitudes toward using EHRs. Therefore, nurse administrators should arrange for the conduct of educational workshops and continuous training programs considering the needs of the nurses.

## 1. Background

Information technology is dramatically, continually evolving and affecting the health care system worldwide. The focus of most health-care institutions during the COVID-19 Disease of 2019 was to improve the quality of patient care by using electronic health records (EHRs) [1] and utilizing updated resources such as electronic journals that encourage nurses to work within the context of evidence-based practice (EBP) [2]. The importance of EHRs during the COVID-19 crisis lies in the early detection of expected infected cases [3,4] and in creating a source for timely data analysis [5].

Nurses are affected by the accelerated development of information technologies [6]. Successful adoption and implementation of EHRs systems requires nurses to be qualified to deal with information technology and have experience in computer skills [7].

Shifting from paper-based systems to fully electronic health records is being advocated by various nations worldwide [8]. This shift can enhance the quality of patient care and nurses' job satisfaction [9].

However, the transition from a paper to an electronic documentation system requires several issues to be considered, such as the variability between participants in their skills, ability to adapt, and attitudes toward computerization [10]. Additionally, nurses' attitudes toward computerization should be considered while adopting a new system to avoid rejection and take appropriate procedures to facilitate its successful adoption [9,11,12].

### 1.1. Before COVID-19 pandemic

Many studies have been implemented to explore the impact of the adoption of EHRs in healthcare settings; some of these studies revealed several benefits of using EHRs in facilitating the nursing process, improving the quality of patient care, enhancing communication between nurses and healthcare providers, reducing paperwork, saving nurses' time, improving documentation, medications administration, and shift handover [13–15]. In developed countries, many studies have been conducted to examine nurses' attitudes toward implementing

**Abbreviations:** SPSS, Statistical Package for Social Sciences; CCU, Coronary care unit; EBP, Evidence-based practice; EHR, Electronic health records; ICU, Intensive care unit; IRB, Institutional review board; NATC, Nurses' attitudes towards computerization; SD, Standard deviation; USA, United States of America.

\* Corresponding author. P.O. Box 3050, Doha, Qatar.

E-mail addresses: [anashwan@hamad.qa](mailto:anashwan@hamad.qa), [nursing861@gmail.com](mailto:nursing861@gmail.com) (A.J. Nashwan).

<https://doi.org/10.1016/j.imu.2022.101102>

Received 1 September 2022; Received in revised form 2 October 2022; Accepted 2 October 2022

Available online 4 October 2022

2352-9148/© 2022 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

information technology systems. In the United States of America (USA), nurses believe EHRs minimize frustration, decrease the time spent with the patient, and increase time working on the computer [11]. While others considered electronic bedside documentation as an opportunity to better answer patients' questions, explain their care plans, ensure accurate and timely patients data entry, and ensure patients' safety [16]. Nurses were not ready to accept the magnitude change as conversion to EHRs, it was the most difficult thing they had ever do, and that relationships between co-workers were diminished [11]. Nurses viewed Information technology as an effective way to provide high-quality care for patients, allow nurses more time to provide the required nursing care [17], give more precise medical measurements and provide credit to the nursing process without weakening their role as caregivers [18].

On the other hand, many studies have been conducted in Arabic developing countries to assess nurses' attitudes toward EHRs implementation. Nurses recognized the need for EHRs in their practice in Palestine [9], realized the usefulness and ease of use of EHRs system, which increased nurses' willingness to utilize EHRs in daily practice in Saudi Arabia [19], and revealed a high mean score of overall satisfaction with utilizing EHRs in the United Arab Emirates [20], that the nurses recognized the need for EHRs in their practice and they exhibited general acceptance of using electronic documentation. However, nurses complained that the training provided was inadequate, and they strongly agreed that training would facilitate their adoption and usage of EHRs [21].

In order to achieve a successful implementation of EHRs, factors influencing health care providers' intention to use EHRs should be examined [22]. Many factors have figured out the nurses' attitudes toward using electronic health records. Nurses' age, gender, educational level, computer experience, work experience, and work unit were commonly investigated factors that were expected to influence nurses' attitudes toward using EHRs [9–11,17,19,23–25].

Previous studies revealed that age was related to nurses' attitudes toward using EHRs positively [10,26] or negatively [17,25]. While other studies denied the presence of a correlation between age and nurses' attitudes toward using EHRs [9,19,23].

Work experience also had found to influence the attitudes of nurses toward using EHRs. Nurses with more work experience were inclined to express more positive attitudes to encourage EHR adoption of EHRs [9,25,26]. On the other hand, nurses reported that work experience influences nurses' attitudes negatively; nurses with less work experience showed more positive attitudes toward information technology [17]. Correspondingly, other studies revealed that years of work experience did not affect the adaptation of nurses to the electronic record system [10,19,23,25,27].

Computer experience was one of the major factors that positively affected the attitudes of nurses that staff members exposed to EHRs adopted more quickly [10,17,23], or negatively that nurses who were nonusers of the computer showed more positive attitudes toward using EHRs [10]. Correspondingly, Aldosari et al. [19] reported no significant relationship between attitudes and computer experience.

Previous studies revealed that female nurses with higher educational levels were more ready to adopt the new electronic record system and expressed the usefulness of its adoption [17,19]. Educational level stimulates nurses to show favorable attitudes toward information systems [9,23,25]. Rawajfah and Tubaishat [22] found that nurses with lower educational qualifications were concerned about having trained more than qualified nurses.

## 1.2. During COVID-19 pandemic

Recently, additional studies have been conducted to explore the presence of EHRs-related stress during the COVID-19 pandemic. Health care providers describe that they were satisfied with utilizing EHRs, despite the expression that using EHRs during the COVID-19 pandemic adds frustration and increases the burden of daily work [28].

Furthermore, the COVID-19 pandemic imposed new tasks on healthcare providers, such as consultations using virtual meetings with patients and electronic prescriptions of patients' medications [29]. As a result of the increasing number of COVID-19 cases, the burnout rate among health-care providers in Saudi Arabia was 75%. [30] Electronic health records have been identified as a burnout contributor by health care providers through increasing frustration and decreasing satisfaction [31].

On the other hand, utilizing the electronic health records system during the COVID-19 pandemic facilitates exploring positive and negative sentiments about care management and therapeutic procedures by analyzing electronic nursing notes about case progress [32].

Previous studies in Jordan aimed to compare the quality of traditional nursing documentation versus electronic documentation. [33]. Other studies addressed the barriers and facilitators of implementing EHRs among Jordanian hospitals [22]. Yet, there is a shortage of studies that explored Jordanian nurses' attitudes toward using EHRs during the COVID-19 pandemic and factors associated with nurses' attitudes toward using EHRs. The significance of this study increases with the appearance of new infectious diseases such as COVID-19. Using EHR made the medical history of the patients available in health care institutions for all health professionals at the same time, without the need to touch the same contaminated surfaces like paper health records which could transmit highly contagious diseases such as COVID-19 [34,35] among health care providers [36]. The objectives of the current study are to determine nurses' attitudes toward using EHRs in their daily work and to address factors that affect their experience in using EHRs during the COVID-19 pandemic.

This study addresses the following questions: What are nurses' attitudes toward using EHRs in Jordan's public health care sector during the COVID-19 pandemic? And what are the factors that affect nurses' attitudes toward using EHRs?

## 2. Methods

A cross-sectional, descriptive correlational design was utilized to perform the study. The target population of the current study was Jordanian registered nurses who work in public hospitals that adopted electronic health records. The accessible population from which the sample was recruited was three major public hospitals (two governmental and one university-affiliated teaching hospital) that adopted electronic health records. The inclusion criteria of the sample included Jordanian registered nurses who dealt with EHRs for at least one year. Exclusion criteria were the practical and associate nurses, nurses who worked in outpatients or emergency departments, and nurses with less than one year of EHR use experience with using EHRs. Participants were recruited by convenience sampling method. The sample size was estimated using Cohen's (1992) tables for the Pearson correlation test with a medium effect size of 0.5, power = 0.8, and  $\alpha = 0.05$ , the recruited number of nurses was 85. To consider possible nonresponse or incomplete questionnaires, the sample size was raised to 180. Questionnaires were distributed to 180 nurses; however, only 130 questionnaires were returned to the researcher with a response rate of 72%. The mean age (SD) of participants was around 33 (6), and the average number of years of work experience was about 8 years.

The instrument used in this study was a self-administered questionnaire. Nurses' Attitudes toward Computerization (NATC) Questionnaire was used after the authors' permission, Stronge & Brodt [37]. The questionnaire had two parts; the first part consisted of demographic data, including age, gender, educational level, previous computer skills experience, years of dealing with EHRs, work experience, work unit, and job title. The second part consisted of 20 Likert scale statements which reflect five domains including benefit to the institution, patient care issues, superior capabilities of computers, willingness to use computers, and legal issues in computer use. Nurses can answer as strongly agree, agree, uncertain, disagree, and strongly disagree. NATC had been checked for reliability and validity [38–41].

A pilot study was conducted on 15 nurses conveniently to examine the instrument's clarity, evaluate participants' comprehension of the questionnaire items, look for additional interpretations, and recognize the estimated time required for each nurse to complete the questionnaire and return it. Cronbach's alpha for the NATC scale was 0.93 which means it is reliable. The participants completed the questionnaire within 10–15 min; they believed it was simple, short, clear, and easy to understand. They expressed their satisfaction with the clarity and simplicity of the items in the questionnaire.

Data were analyzed using the Statistical Package of Social Sciences (SPSS) version 25. First, the participants' attitudes were described by frequency analysis to view the percentage of positive versus negative attitudes toward using the EHRs system. Next, descriptive statistics were applied to the collected data to describe the study's sample. Finally, inferential statistics were used to examine the relationships between nurses' attitudes toward using EHRs and factors that may affect nurses' attitudes toward using EHRs.

### 3. Results

#### 3.1. Description of the study sample

A total of 130 Jordanian nurses recruited from three major public hospitals in Jordan participated in the study. Participants mean age (SD) was around 33.14 (5.66). The majority of participants were females (70%). Around (91%) of participants have a bachelor's degree in nursing. Twenty nurses (15.4%) asserted that they had no previous computer skills experience. The average number of years of dealing with EHRs was five years. Data were collected from six different departments in the three public hospitals surveyed as follows; private suites (4.6%), medical floors (29.2%), surgical floors (36.9%), intensive care unit (ICU) (13.1%), cardiac care unit (CCU) (9.2%), and pediatric floors (6.9%) (Table 1&2) (see Table 2).

#### 3.2. Nurses' attitudes toward using EHRs

According to the author's scoring guidelines, nurses' overall attitudes toward using EHRs were positive. Descriptive analysis of the total attitude scores revealed that the mean (SD) was 61.85 (10.97), the minimum score was 40, and the maximum score was 88. Findings revealed that 54.6% ( $n = 71$ ) of the participants' total attitudes scores were more than 60, representing positive attitudes, whereas 45.4% ( $n = 59$ ) of the nurses' total scores were less than 60 which is interpreted as negative attitudes.

**Table 1**  
Frequency analysis of participants' categorical demographic data.

Variables	Frequency	Percent
<b>Gender</b>		
Male	39	30%
Female	91	70%
<b>Education level</b>		
Bachelor	118	90.8%
Master	12	9.2%
<b>Previous Computer skills experience</b>		
Yes	110	84.6%
No	20	15.4%
<b>Work unit</b>		
Royal suites	6	4.6%
Medical floors	38	29.2%
Surgical floors	48	36.9%
ICU	17	13.1%
CCU	12	9.2%
Pediatric floors	9	6.9%
<b>Hospitals</b>		
University hospital	32	24.6%
Hospital A	34	26.2%
Hospital B	64	49.2%

**Table 2**  
Participants' numerical demographic characteristics.

Characteristics	Mean	Minimum	Maximum	Standard deviation (SD)
Age	33.14	23	53	5.66
Years of work experience	8.81	1	24	6.14
Years of dealing with EHRs	5.26	1	20	4.29

When analyzing the mean scores for each item of the questionnaire, findings revealed that 77.7% of nurses agreed with the statement "The use of computers has greatly reduced paperwork for nurses", and 60.8% in which nurses agreed with the statement "Computers will allow the nurse more time for the professional tasks for which he/she is trained". Additionally, 58.5% of nurses agreed with the statement "Orientation for new employees takes longer because of computers and, therefore, unnecessary work delays occur". On the other hand, 72.3% of nurses disagreed with the statement, "If I had my way, nurses would never have to use computers," negatively worded. Furthermore, 50.8% of nurses disagree that "A computer increases costs by increasing the nurses' workload", and "Time spent using a computer is out of proportion to the benefits" which were also negatively worded statements (Table 3).

#### 3.3. Relationship between nurses' attitudes toward using EHRs and demographic factors

The analysis of the Mann-Whitney  $U$  test revealed no significant differences between males and females, bachelor's degree holders and master's degree holders, or nurses with and without previous computer skills experience in relation to their attitudes toward using EHRs;  $p$ -values were (0.09, 0.45, and 0.35 respectively). However, the Kruskal-Wallis test showed that there was a significant difference between work units regarding the total attitude scores (Kruskal-Wallis  $H = 12.57$ ,  $df = 5$ ,  $p = 0.028$ ), which revealed that royal suites have more attitude scores > CCU > surgical floors > medical floors > ICU > pediatric floors.

Spearman's rho correlation analysis was enrolled to determine the relationships between (age, years of dealing with EHRs, and years of work experience) and the total attitude scores. The findings revealed that there were no statistically significant correlations between nurses' attitude scores and age, years of work experience, and years of dealing with EHRs, the results of spearmen's rho test were ( $r = -0.064$ ,  $p = 0.233$ ;  $r = -0.043$ ,  $p = 0.314$ ;  $r = -0.136$ ,  $p = 0.062$  respectively).

### 4. Discussion

Exploring nurses' attitudes toward using EHRs is an important issue for health care facilities [17]. If the attitudes of nurses and factors influencing their attitudes were sufficiently assessed; then plans that encourage nurses who are less willing to use and accept the new electronic documentation system can be developed [23]. This also will help nursing administrators and leaders to recognize the importance of nurses' engagement in the adoption process of the electronic documentation system from planning until full implementation with sustained support to reduce stress and anxiety [9]. On the other hand, managers and policy-makers should assess the level of computer literacy among health care providers before adopting specific EHRs systems to identify the most suitable system and to provide adequate training to ensure successful implementation [12].

#### 4.1. Attitudes of nurses toward using EHRs

The overall attitudes of Jordanian nurses toward using EHRs in this study were positive, the mean of the total scores was 61.85 (SD = 10.97). About 72% of nurses disagreed with the statement "If I had my way,

**Table 3**

Nurses attitudes towards questionnaire items and the mean score for each item.

Items of nurses' attitudes toward computerization questionnaire N = 130	Agree	Un-certain	Disagree	Mean
1. A computer increases costs by increasing the nurses' workload.	38.4%	10.8%	50.8%	3.13
2. Computers cause a decrease in communication between hospital departments.	53%	8.5%	38.5%	2.74
3. Computers will allow the nurse more time for the professional tasks for which he/she is trained.	60.8%	13.1%	26.1%	3.38
4. Part of the increase in costs of health care is because of computers.	38.5%	10.8%	50.8%	3.09
5. The time spent using a computer is out of proportion to the benefits.	57%	9.2%	33.8%	2.68
6. Computers represent a violation of patient privacy.	56.2%	5.4%	38.4%	2.72
7. Only one person at a time can use a computer terminal; therefore, staff efficiency is inhibited.	53.8%	0%	46.2%	2.86
8. Computerization of nursing data offers nurses a remarkable opportunity to improve patient care.	54.6%	20.8%	24.6%	3.33
9. Computers contain too much personal data to be used in an area as open as a nursing station.	46.9%	5.4%	47.7%	3.02
10. Computers cause nurses to give less time to quality patient care.	47.7%	18.5%	33.8%	2.74
11. If I had my way, nurses would never have to use computers.	27.7%	0%	72.3%	3.50
12. Computers should only be used in the financial department.	30%	2.3%	67.7%	3.48
13. Computers make nurses' jobs easier.	56.9%	17.7%	25.4%	3.43
14. Paperwork for nurses has been greatly reduced by the use of computers.	77.7%	9.2%	13.1%	3.87
15. Orientation for new employees takes longer because of computers and, therefore, unnecessary work delays occur.	58.5%	12.3%	29.2%	2.63
16. Nursing information does not lend itself to computers.	39.2%	25.4%	35.4%	2.96
17. Computers save steps and allow the nursing staff to become more efficient.	55.4%	20%	24.6%	3.41
18. The more computers in an institution, the less the number of jobs for employees.	40.8%	17.7%	41.5%	3.09
19. Increased computer usage will allow nurses more time to give patient care.	50%	10.8%	39.2%	3.09
20. Because of computers, nurses will face more lawsuits.	50.8%	23.8%	25.4%	2.70

nurses would never have to use computers", also around 68% disagreed with the statement "Computers should only be used in the financial department" these results concurred with the findings reported by Salameh et al.'s study [9]. Nurses exhibited favorable attitudes when approximately 57% of the participants reported that "dealing with electronic records makes nurses' job easier" and around 78% of them agreed with the statement that "the use of computers had greatly reduced paperwork". Agreement with those two statements was consistent with Yontz et al.'s study [27] whereas contradicted with the findings of Salameh et al.'s study [9], which utilized the same NATC instrument. This might be because EHRs allowed nurses to read doctors' notes, requests, and medication prescriptions easily and reduced the possibility of errors and mistakes due to illegible handwriting.

On the other hand, regarding time spent dealing with the electronic health system, 60% of nurses supported the item that said, "the time spent using a computer is out of proportion to the benefits". This result is consistent with Schenk et al.'s study [11] which revealed that nurses spent more time on the computer than patients. This result might be explained by inadequate experience in dealing with EHRs and a lack of

continuous training courses about utilizing EHRs effectively. While 59% of nurses agreed with the statement, "Orientation for new employees takes longer because of computers and unnecessary work delays occur". This also might be related to poor computer skills and unfamiliarity with the EHRs system among newly graduated nurses and nurses who have worked in other hospitals that did not adopt the EHRs system yet. Salameh et al. [9] found similar findings. So, it is important to prepare undergraduate nurses for dealing with EHRs in work life.

Legal issues about using EHRs have also been defined by nurses, whereby 56% of the nurses who participated in this study believed that EHRs represented a violation of patients' confidentiality. This might be due to the information security system needing additional precautions. Also, about 51% of nurses agreed with the statement "Because of computers, nurses will face more lawsuits". These two findings were consistent with previous studies [9,17].

#### 4.2. Factors that affected nurses' attitudes toward using EHRs

In this study, the relationships between the participants' demographic data and nurses' attitudes were examined. Previous Studies [9,19,23] agreed with the current study, which showed that the age of participants was not correlated with the attitudes toward using EHRs, and differed on the effect of work experience on nurses' attitudes. Age and work experience were considered interrelated factors; Joseph et al. [17] found that younger nurses who do not have long work experiences exhibit more positive attitudes as they are not yet accustomed to working routines than those nurses with more work experience who find it difficult to accept the new system [17]. Additionally, younger nurses have more energy, motivation, and intense interest to use computer tools and applications than older ones [24]. However, many studies were consistent with the findings of the current study that work experience was not correlated with nurses' attitudes toward using EHRs [10,19,23,25,27].

Interpretation of these findings might be that nurses commonly find themselves being forced to adopt new systems without their contribution to the planning process, leading to resistance to change and refusal to accept the new systems [25]. In light of these findings, assessing nurses' attitudes toward using EHRs before introducing, purchasing, or implementing a new EHRs system is important.

In this study, previous computer skills experience was found to not affect nurses' attitudes toward using EHRs in the public health sector in Jordan. This concurred with the findings of a previous study [42] which utilized the same instrument as the current study. Although, 84.6% of nurses (n = 110) in this study reported that they have previous computer skills experience, only 54.6% of them (n = 71) showed positive attitudes toward using electronic health records systems. This might be explained by the fact that the computer skills taught at the university differ from those required to deal with EHRs. Thus, nurses still need additional training and education to effectively use EHRs.

The educational level included in this study was classified into bachelor's and master's degrees. Although a high percentage of participants (90.8%) were bachelor's degree holders (n = 118), educational level was not associated negatively with nurses' attitudes toward using electronic health records. These findings are similar to that reported in previous studies that use the same NATC instrument [42,43]. This finding might be explained by the lack of educational labs in Jordanian universities which simulate the work environment to prepare nurses for future jobs; therefore, educational labs should be implemented in Jordanian universities for nursing students to be familiar with dealing with EHRs [44]. On the other hand, other studies found that nurses' acceptance and positive attitudes toward using EHRs were highly associated with higher education levels [17,18,23,45].

Participants' gender was another variable that was examined in this study. Despite the that the number of female participants was three times more than male participants in the sample, the findings showed no statistical differences between male and female nurses regarding their



attitudes toward using EHRs. Previous studies found similar findings [9, 24,25].

The association between work units and nurses' attitudes revealed that nurses in royal suites demonstrated more positive attitudes toward using EHRs than intensive units and other floors. The less workload might explain this on nurses of royal suites due to the lower capacity of the department and stable cases of patients in relation to heavy workloads, busy duties, and critical cases of patients in the intensive care units and floors that impede their work on computers. Moreover, this result was in line with the findings of Orhan and Serin [18], who found that nurses didn't want to work in units that used EHRs intensively [18].

Previous studies contradicted the current study's findings and revealed that years of dealing with EHRs positively affect nurses' attitudes toward using EHRs [17,21,23,46]. Findings of the current study are consistent with McBride & Nagle's study [43], which used the same instrument (NATC questionnaire) used in the current study. This result might be explained by having poor skills in dealing with EHRs, inadequate continuous training, and a lack of problem-solving strategies and critical thinking in dealing with emerging problems concerning EHRs systems. Previous studies found that the presence of qualified information technology technicians is considered one of the major facilitators of EHRs adoption and implementation [22,47]. So, it was recommended that the information technology technician be available over 24 h to handle any electronic problems [48].

## 5. Ethical considerations

Ethical approvals to conduct this study were obtained from the Faculty of Graduate Studies at Zarqa University and then from the Institutional Review Board (IRB) of the Jordanian Ministry of Health and the University Hospital. Informed consent was obtained from each participant before filling out the questionnaire and after explaining the aims of the study and study procedures. Participation was entirely voluntary, and participants had the right to participate, refuse, or withdraw from the study at any time. Participants were provided with the needed clarifications and encouraged to ask questions. Enough time was given to participants to fill in the questionnaire according to their time and workload. Participants' anonymity was assured by explaining that the coded questionnaires would be used to control the accuracy of the data. Participants were also assured of their confidentiality by using the collected data for research purposes only.

## 6. Limitations

In the current study, data was collected from nurses at a single point in time. Therefore, longitudinal studies are required to collect data from nurses at different points over an extended period to assess changes in nurses' attitudes toward using EHRs over time and the long-term impact of computerized work. Using a convenient sample was also one of the current study's limitations. Convenience sampling is one of the non-probability samples subject to bias and less likely to produce a representative sample. Further, the sample of this study was recruited from three public hospitals in two major cities in Jordan (Amman and Zarqa). This data was collected from only two geographical areas in Jordan. In the future, it is recommended to include larger samples of nurses from different geographical areas to enhance the generalizability of the study findings. Additional studies are recommended to recognize the effectiveness of information technology in limiting the spread of the COVID-19 pandemic in Jordan.

## 7. Conclusion

The adoption and implementation of EHRs in Jordan have continuously evolved to keep up with the development of information technology in health care facilities internationally. Nowadays, especially with the spread of the COVID-19 pandemic and the evidence that proved

the importance of information technology during the COVID-19 pandemic, Jordan is in a challenging phase of expanding the implementation of EHRs in health care facilities and ensuring successful adoption through assessing the attitudes of the health care providers, especially nurses, who are in the first line to deal with patients and EHRs. In the current study, the overall attitudes of Jordanian nurses toward using EHRs were positive. Also, there was no significant association between demographic variables and nurses' attitudes toward using EHR systems. However, the work units significantly affected nurses' attitudes toward using the EHR system.

## 8. Implication

In light of the current study, nurses' computer skills should be improved by excessive and continuous training and education that is not only limited to orientation programs but also included in staff development and follow-up programs considering the educational needs of nurses. On the other hand, nurse administrators should be assured that nurses are at the table and involved in the process of EHRs adoption from the planning phase to the final implementation.

Additional longitudinal studies should evaluate changes in registered nurses' attitudes toward using electronic health records over time. Further studies are also recommended to assess nurses' attitudes toward using EHRs from all geographical areas in Jordan that utilize the EHRs system. On the other hand, further studies are required to explore perceived barriers and facilitating factors for utilizing EHRs in Jordan from nurses' points of view.

## Ethics approval and consent to participate

Ethical approvals to conduct this study were obtained from the Faculty of Graduate Studies at Zarqa University and then from the (IRB) committee of the Jordanian Ministry of Health and the University Hospital. Informed consent was obtained from each participant before filling out the questionnaire and after explaining the study's aims and study procedures. Participation was entirely voluntary, and participants had the right to participate, refuse, or withdraw from the study at any time. Participants were provided with the needed clarifications and encouraged to ask questions. Enough time was given to participants to fill in the questionnaire according to their time and workload. Participants' anonymity was assured by explaining to them that the coded questionnaires would be used to control the accuracy of the data. Participants have also assured confidentiality by using the collected data for research.

## Availability of data and material

All data generated during this study is included in this published article.

## Funding

This study was not funded.

## Authors' contributions

WHA: Conceptualization, Literature search, Manuscript preparation. GMA, IAO, RIS, and AJN: Literature search, Manuscript preparation, final editing.

All authors read and approved the final manuscript.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Acknowledgments

The authors are appreciative of all nurses who participated in this study for their cooperation. Open Access funding provided by the Qatar National Library.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.imu.2022.101102>.

## References

- Reeves JJ, Hollandsworth HM, Torriani FJ, et al. Rapid response to COVID-19: health informatics support for outbreak management in an academic health system. *J Am Med Inf Assoc* 2020;27(6):853–9. <https://doi.org/10.1093/jamia/ocaa037>.
- Farokhzadian J, Khajouei R, Ahmadian L. Information seeking and retrieval skills of nurses: nurses readiness for evidence based practice in hospitals of a medical university in Iran. *Int J Med Inf* 2015;84(8):570–7. <https://doi.org/10.1016/j.ijmedinf.2015.03.008>.
- Vaishya R, Haleem A, Vaish A, Javaid M. Emerging technologies to combat the COVID-19 pandemic. *J Clin Exp Hepatol* 2020;10:409–11.
- Dong E, Du H, Gardner L. An interactive web-based dashboard to track COVID-19 in real time [published correction appears in *Lancet Infect Dis*. *Lancet Infect Dis* 2020 Sep;20(9):e215. [https://doi.org/10.1016/S1473-3099\(20\)30120-1](https://doi.org/10.1016/S1473-3099(20)30120-1). 2020;20(5):533–534.
- Wang CJ, Ng CY, Brook RH. Response to COVID-19 in Taiwan: big data analytics, new technology, and proactive testing. *JAMA* 2020;323:1341–2.
- Elsevier. Introduction to health services administration - E-Book. Mosby; 2017. <https://books.google.at/books?id=FE7DwAAQBAJ>.
- Darvish A, Bahramnezhad F, Keyhanian S, Navidhamidi M. The role of nursing informatics on promoting quality of health care and the need for appropriate education. *Global J Health Sci* 2014;6(6). <https://doi.org/10.5539/gjhs.v6n6p11>.
- Topaz M, Ronquillo C, Peltonen LM, et al. Nurse informaticians report low satisfaction and multi-level concerns with electronic health records: results from an international survey. *AMIA Annu Symp Proc* 2017;2016:2016–25.
- Salameh B, Eddy L, Batran A, Hijaz A, Jaser S. Nurses' attitudes toward the use of an electronic health information system in a developing country. *SAGE Open Nurs*; 2019. 237796081984371. <https://doi.org/10.1177/2377960819843711>.
- Colligan L, Potts H, Finn C, Sinkin R. Cognitive workload changes for nurses transitioning from a legacy system with paper documentation to a commercial electronic health record. *Int J Med Inf* 2015;84(7):469–76. <https://doi.org/10.1016/j.ijmedinf.2015.03.003>.
- Schenk E, Mayer D, Ward-Barney E, Estill P, Goss L, Shreffler-Grant J. RN perceptions of a newly adopted electronic health record. *J Nurs Adm: J Nurs Adm* 2016;46(3):139–45. <https://doi.org/10.1097/nna.0000000000000313>.
- Spatar D, Kok O, Basoglu N, Daim T. Adoption factors of electronic health record systems. *Technol Soc* 2019;58:101144. <https://doi.org/10.1016/j.techsoc.2019.101144>.
- Hessels A, Flynn L, Cimiotti JP, Bakken S, Gershon R. Impact of health information technology on the quality of patient care. *Online J Nurs Inform* 2015;19. <http://www.himss.org/impact-health-information-technology-quality-patient-care>.
- Lee T, Sun G, Kou L, Yeh M. The use of information technology to enhance patient safety and nursing efficiency. *Technol Health Care* 2017;25(5):917–28. <https://doi.org/10.3233/thc-170848>.
- Top M, Yilmaz A, Karabulut E, et al. Validation of a nurses' views on electronic medical record systems (EMR) questionnaire in Turkish health system. *J Med Syst* 2015;39(6). <https://doi.org/10.1007/s10916-015-0250-2>.
- Graham H, Nussdorfer D, Beal R. Nurse attitudes related to accepting electronic health records and bedside documentation. *Comput Inf Nurs* 2018;36(11):515–20. <https://doi.org/10.1097/cin.0000000000000491>.
- Joseph M, Inayat S, Hussain M, Afzal M. Factors influencing nurses' attitudes towards information technology in nursing practice. *Eur Acad Res* 2019;7(3):1751–69.
- Orhan I, Serin E. Use of health technologies by nurses and their thoughts on technology. *Int J Caring Sci* 2019;12(1):416–22.
- Aldosari B, Al-Mansour S, Aldosari H, Alanazi A. Assessment of factors influencing nurses acceptance of electronic medical record in a Saudi Arabia hospital. *Inform Med Unlocked* 2018;10:82–8. <https://doi.org/10.1016/j.imu.2017.12.007>.
- Bani-issa W, Al Yateem N, Al Makhzomy I, Ibrahim A. Satisfaction of healthcare providers with electronic health records and perceived barriers to its implementation in the United Arab Emirates. *Int J Nurs Pract* 2016;22(4):408–16.
- Bazzaz N, Paget T. Hospital staff have positive attitudes towards EHR and optimistic expectations towards EHR implementation: a quantitative survey on one hospital in Kuwait. *Nursing & Primary Care* 2019;3(5). <https://doi.org/10.33425/2639-9474.1119>.
- Al-Rawajfah O, Tubaishat A. Barriers and facilitators to using electronic healthcare records in Jordanian hospitals from the nurses' perspective: a national survey. *Inf Health Soc Care* 2017;44(1):1–11. <https://doi.org/10.1080/17538157.2017.1353998>.
- Ifinedo P. The moderating effects of demographic and individual characteristics on nurses' acceptance of information systems: a Canadian study. *Int J Med Inf* 2016;87:27–35. <https://doi.org/10.1016/j.ijmedinf.2015.12.012>.
- Singh B, Acharyya D. Nurse's attitude towards computerization in private hospitals of Tamil Nadu, India. *Res J Pharm Technol* 2016;9(12):2204–10.
- Kipturgo M, Kivuti-Bitok L, Karani A, Muiva M. Attitudes of nursing staff towards computerisation: a case of two hospitals in Nairobi, Kenya. *BMC Med Inf Decis Making* 2014;14(1). <https://doi.org/10.1186/1472-6947-14-35>.
- Chapman Y, Schweickert P, Swango-Wilson A, Aboul-Enein F, Heyman A. Nurse satisfaction with information technology enhanced bedside handoff. *Medsurg Nurs* 2016;(July/August 2016 issue).
- Yontz L, Zinn J, Schumacher E. Perioperative nurses' attitudes toward the electronic health record. *J PeriAnesthesia Nurs* 2015;30(1):23–32. <https://doi.org/10.1016/j.jopan.2014.01.007>.
- Almulhem JA, Aldekhayel RN, Binkheder S, Temsah MH, Jamal A. Stress and burnout related to electronic health record use among healthcare provider during the COVID-19 pandemic in Saudi Arabia: a preliminary national randomize survey. *Healthcare* 2021;9:1367. <https://doi.org/10.3390/healthcare9101367>.
- Hassounah M, Raheel H, Alhefzi M. Digital response during the COVID-19 pandemic in Saudi Arabia. *J Med Internet Res* 2020;22(9):e19338. <https://doi.org/10.2196/19338>.
- Alsulimani LK, Farhat AM, Borah RA, et al. Health care worker burnout during the COVID-19 pandemic: a cross-sectional survey study in Saudi Arabia. *Saudi Med J* 2021;42(3):306–14. <https://doi.org/10.15537/smj.2021.42.3.20200812>.
- Tajirian T, Stergiopoulos V, Strudwick G, et al. The influence of electronic health record use on physician burnout: cross-sectional survey. *J Med Internet Res* 2020;22(7):e19274. <https://doi.org/10.2196/19274>. Published 2020 Jul 15.
- Cuenca-Zaldívar JN, Torrente-Regidor M, Martín-Losada L, Fernández-De-Las-Peñas C, Florencio LL, Sousa PA, Palacios-Ceña D. Exploring sentiment and care management of hospitalized patients during the first wave of the COVID-19 pandemic using electronic nursing health records: descriptive study. *JMIR Med Inform* 2022;10(5).
- Akhu-Zaheya L, Al-Maaitah R, Bany Hani S. Quality of nursing documentation: paper-based health records versus electronic-based health records. *J Clin Nurs* 2017;27(3–4). <https://doi.org/10.1111/jocn.14097>.
- Zhang JJ, Dong X, Cao YY, Yuan YD, Yang YB, Yan YQ, Akdis CA, Gao YD. Clinical characteristics of 140 patients infected with SARS-CoV-2 in Wuhan, China. *Allergy*; 2020.
- Dilcher M, Werno A, Jennings LC. SARS-CoV-2: a novel deadly virus in a globalised world. *N Z Med J* 2020;133:6–11.
- Ren SY, Wang WB, Hao YG, et al. Stability and infectivity of coronaviruses in inanimate environments. *World J Clin Cases* 2020;8(8):1391–9. <https://doi.org/10.12998/wjcc.v8.i8.1391>.
- Stronge JH, Brodt A. Assessment of nurses' attitudes toward computerization. *Comput Nurs* 1985;3(4):154–8.
- Stockton AH, Verhey MP. A psychometric examination of the Stronge Brodt nurses' attitudes toward computers questionnaire. *Comput Nurs* 1995;13(3):109–13.
- Lou M, Stricklin V, Bierer B, Struk C. Home care nurses' attitudes toward computers: a confirmatory factor analysis of the Stronge and Brodt instrument. *Comput Inf Nurs* 2003;21(1):103–10.
- Schwirian PM, Malone JA, Stone VJ, Nunley B, Francisco T. Computers in nursing practice. A comparison of the attitudes of nurses and nursing students. *Comput Nurs* 1989;7(4):168–77.
- Scarpa R, Smeltzer SC, Jasion B. Attitudes of nurses toward computerization: a replication. *Comput Nurs* 1992;10(2):72–80.
- Sultana N. Nurses' attitudes towards computerization in clinical practice. *J Adv Nurs* 1990;15(6):696–702. <https://doi.org/10.1111/j.1365-2648.1990.tb01893.x>.
- McBride SH, Nagle LM. Attitudes toward computers. A test of construct validity. *Comput Nurs* 1996;14(3):164–70.
- Al-Sghayer M, Alsadi M, Ghosh Z. Electronic health records and health care. 2016. Retrieved from, <https://ehs.com.jo/publicationsresearch/electronic-health-record-s-and-health-care-jordan>.
- Kinnunen UM, Heponiemi T, Rajalahti E, Ahonen O, Korhonen T, Hyppönen H. Factors related to health informatics competencies for nurses-results of a national electronic health record survey. *Comput Inform Nurs* 2019;37(8):420–9. <https://doi.org/10.1097/CIN.0000000000000511>.
- Topkaya SG, Kaya N. Nurses' computer literacy and attitudes towards the use of computers in health care. *Int J Nurs Pract* 2014;21:141–9. <https://doi.org/10.1111/ijn.12350>.
- Marca G, Perez A, Blanco-Garcia MG, Miravalles E, Soley P, Ortega B. The use of electronic health records in Spanish hospitals. *Health Inf Manag* 2014;43(3):37–44. <https://doi.org/10.1177/183335831404300305>.
- Mahalli A. Adoption and barriers to adoption of electronic health records by nurses in three governmental hospitals in eastern province, Saudi Arabia, 12. *Perspectives in Health Information Management*; 2015.