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ORIGINAL PAPER

Technology acceptance model among nurses and other healthcare providers during the 2019 Coronavirus pandemic: a comparative cross-sectional study

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Abstract

Aim: The study aimed to explore differences in usefulness and the ease of use of electronic health records (EHRs) as perceived by nurses and other healthcare providers (HCPs) during the 2019 coronavirus (Covid-19) pandemic in Jordan. It also aimed to investigate the association of gender, marital status, age, educational level, experience, and experience of using EHRs in predicting the technology acceptance model (TAM) of EHRs among the same selected group. *Design:* A comparative cross-sectional study. *Methods:* A convenience sample of 90 nurses and 96 HCPs completed the technology acceptance model survey. The response rate for nurses was 60%, compared to 64% for HCPs. The study was conducted from May to July 2020. *Results:* The study found that, generally, both nurses and other HCPs perceived high levels of usefulness and ease of use of EHRs during the Covid-19 pandemic. Other HCPs perceived higher levels of usefulness (86%) and ease of use (76.5%) of EHRs than nurses (79.5% and 73.5%, respectively) during the Covid-19 pandemic. Statistical differences were noted between both groups ($p < 0.05$). Marital status and experience in using EHRs were found to be associated with TAM among nurses. There were no associations of TAM among other HCPs during the Covid-19 pandemic. *Conclusion:* Due to the nature of nurses' work, the implementation and acceleration of the use of EHRs during the Covid-19 pandemic could be expected to encounter certain obstacles.

Keywords: Covid-19 pandemic, healthcare providers, nurses, technology acceptance model.

Introduction

Health information technology has become an important issue in the medical field. However, electronic health records (EHRs) generally improve healthcare quality, reduce clinical errors, and in terms of societal outcomes, they enhance the ability to conduct research, improve population health, and reduce costs (Menachemi & Collum, 2011). They can also improve the overall quality of hospital processes, which is reflected in quality indicators (Conte et al., 2019). EHRs can provide easy access to patient information, facilitating research and the implementation of evidence-based interventions (Clegg et al., 2016).

An EHR is an electronic record that contains the medical history, previous reports and notes, and any medical data related to the patient (Denaxas & Morley, 2015). The technology acceptance model (TAM) has become a widely used tool to assess the usefulness and ease of use of electronic records among healthcare providers (Holden et al., 2016; Kamal et al., 2020).

The TAM is recognized as having two dimensions: the first of which is usefulness, which mostly correlates with job performance, while the second dimension is the ease of use of EHR, which mainly measures the level of effort used in maintaining electronic records (Davis, 1989). Improving the perceived usefulness of EHRs is important in enhancing EHR acceptance (Kowitlawakul et al., 2015). By the same token, lack of perceived usefulness presents a barrier to the adoption of EHRs among healthcare providers (Kruse et al., 2016). Collectively, both dimensions have a clear effect on adopting electronic health records (Hoque, 2016).

Several studies have associated nurses and other HCPs such as physicians, pharmacists, and lab technicians, with the use of EHRs. A study

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performed in Jordan showed a positive perception toward EHRs among nurses (Tubaishat, 2018). A longitudinal study among clinicians found that EHRs enhanced healthcare quality, decreased errors in medication, and advanced communication (El-Kareh et al., 2009). On the other hand, other HCPs have exhibited limited acceptance of electronic records as well as technology in their workplace. In the USA, low satisfaction levels had been observed among physicians toward use of EHRs (Meyerhoefer et al., 2018). Research also found that other HCPs experienced a lower rate of positive expectations of EHRs (Joukes et al., 2019).

During the Covid-19 pandemic, hospitals focused intensively on EHRs rather than paper records since EHRs have only recently been introduced in Jordan health institutes (Al-Sghayer et al., 2016). However, accelerating EHR use among nurses and other HCPs without planning and structure might hamper the acceptance of electronic records. To that extent, this study aimed to explore the perception levels of HCPs toward usefulness and ease of use of EHRs during the Covid-19 pandemic. Moreover, it evaluated the relationships and differences between the usefulness and ease of use of EHRs based on the selected nurses and other HCPs in this study. Finally, this study investigated several demographic factors including gender, marital status, age, educational level, experience, and experience with using EHRs to evaluate their separate association with TAM among nurses and other HCPs during the period of Covid-19 pandemic.

Aim

Four aims have been identified in our research:

1) To explore the perceived level of usefulness and perceived level of ease use of EHRs among nurses and other HCPs during the Covid-19 pandemic in Jordan.
2) To evaluate the relationship between the usefulness and ease of use of EHRs among nurses and other HCPs during the Covid-19 pandemic in Jordan.
3) To evaluate the differences in perceptions of EHRs among nurses and other HCPs during the Covid-19 pandemic in Jordan.
4) To investigate the association of gender, marital status, age, educational level, experience, and experience with using EHR in predicting the technology acceptance model of EHR among nurses and other HCPs during the Covid-19 pandemic in Jordan.

Methods

Design

A comparative cross-sectional design.

Sample

The study was conducted at Jordan University Hospital in Amman – Jordan. The selected hospital is one of the largest tertiary hospitals in Jordan, with a 600-bed capacity. This hospital was chosen since it had a large number of nurses and other HCPs, had applied an EHR system, and was readily accessible for the research. Employees with less than six months' experience and working part-time were excluded since their experience with using EHRs was limited. Moreover, we excluded nurses and other HCPs who worked in the operating room and outpatient's clinics. The inclusion criteria were all nurses and other HCPs not ruled out by the exclusion criteria. The study population consisted of two groups; the first included clinical staff nurses from different departments in the selected hospital. The second group consisted of HCPs, including physicians, pharmacists, and lab technicians. To establish the sample size in each group, a sample size of 100–300 participants would be necessary to have a confidence level of 95% and a margin of error of 5% (Hair et al., 2014). To achieve the required sample size, three hundred self-administered questionnaires were distributed conveniently (150 nurses and 150 HCPs) in the selected hospital. The number of nurses who returned valid questionnaires was 90 – a response rate of 60%, while the number of other HCPs who returned valid questionnaires was 96 – response rate of 64%.

Data collection

Data were collected over a three-month period from May to July 2020 during the Covid-19 pandemic in Jordan, since the first reported case in Jordan was in March 2020 (World Health Organization [WHO], 2020). We put together an envelope that contained the consent form, socio-demographic questions (e.g., on gender, marital status, age, educational level, experience, and experience with using EHRs), and the TAM survey. It took three-four minutes to complete the survey. We distributed the envelope to participants in person either in the morning or during break times and explained the study aims to them, asking them to complete the forms and return them there and then. If not possible, participants were asked to leave the envelope with the completed forms in the supervisors' office. Approval from Jordan University Hospital to collect the data was obtained (No. 10/2020/9607).

The ethical principles of the Helsinki declaration were followed, and the informed consent of each participant was obtained. During the process of data collection, participants had the right to refuse to participate and the confidentiality and anonymity of their responses were guaranteed.

Technology Acceptance Model Survey: The TAM survey adapted from Davis (1989) was used to explore the perceived level of usefulness and ease of use of EHRs among nurses and other HCPs in Jordan during the Covid-19 pandemic. We gained official permission from the author to use the TAM survey and adapt it as needed. The survey consists of 28 items measuring two main dimensions. The first dimension (14 items) measures the usefulness of EHRs, such as effectiveness, control, and productivity. The second dimension (14 items) assesses the ease of use of EHRs in the workplace. Globally, the TAM survey has good psychometric properties (Bagot et al., 2020; Barzekar et al., 2019). However, we checked the validity and reliability of the TAM survey before an Arabic language version was produced. Face validity was assessed through a pilot study of 30 nurses, who were asked to provide suggestions regarding context, linguistic, ambiguity, and simplicity of the Arabic version of the TAM items. All items achieved face validity. Content validity was performed with the participation of ten experts (three Ph.D. holders specializing in nursing, three Ph.D. holders specializing in health informatics, two Ph.D. holders specializing in English, and two Ph.D. holders specializing in educational counseling). Some amendments were made to Arabic items to make them suitable for the participants, and overall, the results indicated that the average score was 91%, indicating content validity (Yusoff, 2019).

Construct validity was assessed by explanatory factor loading, sampling adequacy using Kaiser-Meyer-Olken (KMO), and Bartlett's test of sphericity. The results revealed that the factor loading of the Arabic usefulness dimension had a range between 0.54–0.87 and 0.41–0.81 for the Arabic ease of use dimension. In addition, the KMO test result was 0.92 and 0.84 for dimensions of usefulness and ease of use (Shirinbayan et al., 2020). The results of Bartlett's test of sphericity were typically significant and suitable for the usefulness dimension (Chi-square [$\chi 2$] = 2163.3; df = 91; $p < 0.001$) as well as the ease-of-use dimension ($\chi 2$ = 1348.2; df = 91; $p < 0.001$) (Rafique et al., 2020). Regarding reliability, the total Cronbach's Alpha of the TAM survey was 0.92, and for the dimensions it was 0.95 and 0.82 for usefulness and ease-of-use, respectively.

We measured the TAM survey on a four-point Likert scale ranging from "Strongly agree," to "Strongly disagree." These items in the TAM survey (1, 2, 3, 4, 5, 7, 9, and 10) were rated in reverse order due to their negative wording. The cutoff point was calculated based on the following equation.

$$Cutoff\ point = \frac{Upper\ score - Lower\ score}{Levels}$$

Data analysis

The data were analyzed by Statistical Package for Social Sciences (SPSS v. 23). After receiving the completed questionnaire, a pre-processing step was applied to remove incomplete or invalid data. Descriptive statistics means, standard deviations, and frequencies were used for the demographic factors and study variables according to the levels of measurement. Pearson correlation coefficients (r) and independent sample t-test were used to find any associations between the items of usefulness and ease of use between both groups. In addition, stepwise linear regression was conducted to determine the predictors of TAM among nurses and other HCPs.

Results

The participants' characteristics are presented in Table 1. The majority of the participants (n = 90; 48.4%) worked as nurses. Of the total participants (n = 186), 109 (58.6%) were female, with a mean age of 30.7 years (SD = 5.6), ranging from 23 to 52 years. In addition, the majority (n = 186; 60%) of the participants held a bachelor's degree. The working experience mean was 7.5 years (SD = 6.1), ranging from one year to 31 years.

Table 2 displays the statistics, overall levels, and Pearson correlation coefficients used to achieve aims number one and two.

The results indicated that both nurses and HCPs perceived usefulness and ease-of-use of EHRs positively during the Covid-19 pandemic in Jordan. Both groups were found to be at high perceived levels. Person's correlation coefficients indicated that the level of perceived usefulness was positively associated with the level of ease-of-use ($r = 0.53$; $p < 0.001$) of EHRs in both groups during the Covid-19 pandemic in Jordan (Table 2).

Tables 3 and 4 show the results of independent sample t-test, p-values, means, and standard deviations conducted to investigate the differences in EHR usefulness and ease of use between the two groups.

Table 1 Participants' demographic characteristics (n = 186)

Demographic factors		Nurses (90) Frequency (%)	Healthcare providers (96) Frequency (%)
Gender	male	45 (50)	32 (33.3)
	female	45 (50)	64 (66.7)
Marital status	single	25 (27.7)	59 (61.5)
	married	65 (72.3)	37 (38.5)
Educational level	diploma	13 (14.4)	8 (8.3)
	bachelor	63 (70)	49 (51)
	postgraduate	14 (15.6)	39 (40.6)
Age (Year)	mean ± SD	33.4 ± 5.71	28.1 ± 4.17
Experience (Year)	mean ± SD	10.8 ± 6.04	4.36 ± 4.31
Experience with EHRs (Year)	mean ± SD	4.17 ± 3.64	3.34 ± 3.21

EHR – electronic health record; SD – standard deviation

Table 2 Statistics and Pearson correlation coefficients for the perceived level of usefulness and ease of use (n = 186)

EHR sub-scale	Nurses (n = 90) mean ± SD	Overall level	r	p-value	HCPs (n = 96) mean ± SD	Overall level	r	p-value
Perceived usefulness level	3.05 ± 0.52	high	0.37	< 0.001***	3.33 ± 0.47	high	0.53	< 0.001***
Perceived ease of use level	2.89 ± 0.36	high			2.96 ± 0.39	high		

*EHR – electronic health record; HCPs – healthcare providers; SD – standard deviation; r – Pearson correlation coefficients; ***p-value < 0.001*

Generally, nurses participating in this study had lower EHR usefulness levels (79.5%) than other HCPs (86%) during the Covid-19 pandemic. Moreover, participating HCPs had higher EHR ease-of-use levels (76.5%) than nurses (73.5%). However, there are no significant differences between nurses and other HCPs regarding ease of use of EHRs.

During the Covid-19 pandemic, the total perceived level of TAM among both nurses and HCPs was at a high level. The results of an independent sample t-test indicated statistically significant differences between them (t-test = 3.06; df = 184; p-value = 0.003).

Table 3 The differences between both groups in usefulness of EHRs (n = 186)

#	Items Usefulness of EHR	Nurses (n = 90; 79.5%) mean ± SD	HCPs (n = 96; 86.0%) mean ± SD	t-test	p-value
1	**My job would be difficult to perform without EHRs.**	2.87 ± 0.71	3.30 ± 0.58	4.60	< 0.001***
2	**Using EHRs gives me greater control over my work.**	3.11 ± 0.61	3.41 ± 0.52	3.58	< 0.001***
3	**Using EHRs improves my job performance.**	3.10 ± 0.64	3.35 ± 0.58	2.85	0.005**
4	**The EHR system addresses my job-related needs.**	3.09 ± 0.65	3.34 ± 0.63	2.72	0.007**
5	**Using EHRs saves me time.**	3.09 ± 0.73	3.45 ± 0.61	3.64	< 0.001***
6	**EHRs enable me to accomplish tasks more quickly.**	3.09 ± 0.65	3.27 ± 0.70	1.83	0.068
7	**EHRs support critical aspects of my job.**	3.03 ± 0.69	3.27 ± 0.59	2.52	0.013*
8	**Using EHRs reduces the time I spend on unproductive activities.**	3.01 ± 0.69	3.27 ± 0.76	2.43	0.016*
9	**Using EHRs reduces the time I spend on unproductive activities.**	3.03 ± 0.64	3.17 ± 0.63	1.43	0.154
10	**Using EHRs enhances my effectiveness on the job.**	3.04 ± 0.67	3.30 ± 0.56	2.85	0.005**
11	**Using EHRs improves the quality of work I do.**	3.11 ± 0.61	3.32 ± 0.72	2.16	0.032*
12	**Using EHRs increases my productivity.**	3.02 ± 0.65	3.32 ± 0.62	3.21	0.002**
13	**Using EHRs makes it easier to do my job.**	3.03 ± 0.68	3.33 ± 0.69	2.99	0.003**
14	**Overall, I find the EHR system useful in my job.**	3.18 ± 0.65	3.44 ± 0.62	2.78	0.006**

*EHR – electronic health record; HCPs – healthcare providers SD – standard deviation; *p-value < 0.05; **p-value < 0.01; ***p-value < 0.001*

To provide insight into the association of gender, marital status, age, educational level, experience, and experience with using EHRs among both groups (nurses vs other HCPs) with TAM, stepwise linear regression was performed separately and presented in Table 5.

We found that marital status and experience with using EHRs were associated with TAM among nurses. The total variation was 11.9%. Marital status and experience with using EHRs were 7.4% and 4.4%, respectively. Surprisingly, during the Covid-19 pandemic, there were no predictors of TAM among other HCPs (Table 5).

Table 4 The differences between both groups in ease of use of EHRs (n = 186)

#	Items Ease of use of EHRs	Nurses (n = 90; 73.5%) mean ± SD	Healthcare providers (n = 96; 76.5%) mean ± SD	t-test	p-value
1	**I often become confused when I use the EHR system.**	3.07 ± 0.56	3.16 ± 0.59	1.07	0.003**
2	**I make errors frequently when I use the EHR system.**	2.98 ± 0.56	2.95 ± 0.76	0.31	0.28
3	**Interacting with the EHR system is often frustrating.**	3.01 ± 0.68	3.22 ± 0.78	1.94	0.76
4	**I need to consult the user manual often when using EHRs.**	2.79 ± 0.71	3.16 ± 0.85	1.020	0.05*
5	**Interacting with the EHR system requires a lot of my mental effort.**	2.81 ± 0.70	2.91 ± 0.67	0.95	0.34
6	**I find it easy to recover from errors encountered while using electronic medical records.**	2.77 ± 0.64	2.59 ± 0.67	1.80	0.07
7	**The EHR system is rigid and inflexible to interact with.**	2.97 ± 0.63	3.17 ± 0.61	2.21	0.02*
8	**I find it easy to get the EHR system to do what I want it to do.**	2.89 ± 0.61	2.86 ± 0.73	0.25	0.81
9	**The EHR system often behaves in unexpected ways.**	2.69 ± 0.61	2.69 ± 0.70	0.01	0.98
10	**I find it cumbersome to use the EHR system.**	2.91 ± 0.65	3.13 ± 0.74	2.09	0.03*
11	**My interaction with the EHR system is easy for me to understand.**	2.88 ± 0.62	2.99 ± 0.72	1.14	0.25
12	**It is easy for me to remember how to perform tasks using EHRs.**	2.92 ± 0.56	3.02 ± 0.69	1.06	0.29
13	**The EHR system provides helpful guidance in performing tasks.**	2.91 ± 0.59	2.81 ± 0.82	0.93	0.35
14	**Overall, I find the EHR system easy to use.**	2.94 ± 0.61	3.06 ± 0.76	1.16	0.25

*HER – electronic health record; HCPs – healthcare providers; SD – standard deviation; *p-value < 0.05; **p-value < 0.01; ***p-value < 0.001*

Table 5 Predictors of Technology acceptance model of EHRs among participants (n = 186)

Group	Model	R	R^2	R change	Unstandardized Coefficients		t-test	p-value
					B	Std. Error		
Nurses	1[a]	0.273	0.074	0.074	2.668	0.122	21.922	< 0.001***
					0.169	0.064	2.660	< 0.001***
	2[b]	0.345	0.119	0.044	2.545	0.133	19.10	< 0.001***
					0.188	0.063	2.98	0.004**
					0.021	0.010	2.09	0.039*
Healthcare providers	-	-	-	-	-	-	-	-

*group 1 – nurses; [a]predictors – marital status; [b]predictors – marital status, experience in using EHRs; *p-value < 0.05; **p-value < 0.01; ***p-value < 0.001*

Discussion

This study provides evidence of the perceived level of usefulness and ease of use of EHRs among nurses and other HCPs during the Covid-19 pandemic in Jordan. Our results illustrate the difference between nurses and other HCPs. Important differences were observed between them in relation to the acceptance and acceleration of TAM during the Covid-19 pandemic. Lack of experience with using EHRs and the socio-demographic factor of marital status were associated with TAM among nurses only.

During the Covid-19 pandemic, other HCPs reported a higher perceived level of usefulness and ease of use compared to nurses. This result suggests that other HCPs are more familiar with TAM than nurses, a result that has been identified in a previous study which found that healthcare professionals have strong intention to use and positive attitude to using electronic records (Kalayou et al., 2020). The underlying explanation for this is that nurses

were subject to time pressure, burnout, and a lack of nurses, and had to deal with more critical cases than other HCPs, especially during the Covid-19 pandemic with its excess mortality rate (Alfuqaha & Alsharah, 2018; Alfuqaha et al., 2019). Alternatively, it could be related to their perception of TAM's uselessness during the Covid-19 pandemic in the workplace. These findings are consistent with previous studies (Claudio et al., 2015; Tubaishat, 2018). However, one previous study of nurses in Hong Kong found that positive attitudes were associated with higher ease of use of TAM, which may be due to nurse satisfaction (Chow et al., 2012).

The differences between nurses and other HCPs can be explained by the fact that other HCPs used EHRs more than nurses before the Covid-19 pandemic. Nurses believed that technology was useful, but they were limited in their use of technology since it would require learning new skills and, thus, increase their workload and expected effort. Nurses' EHR training process and computer skills were shown to have a significant impact on positive patient outcomes (Zaman et al., 2021).

Our data suggested that other HCPs were perceived to be able to implement TAM more smoothly than nurses. An explanation for this is that HCPs are more familiar with technology and have been educated in it in previous positions. Other HCPs indicated that the usefulness of EHRs would be to increase productivity, accomplish tasks, and support work. On the other hand, due to their excessive use of EHRs, other HCPs became confused, frustrated, and had to consult the user manual. However, overall, other HCPs have found EHR systems easy to use. This result both conforms with previous studies (Basak et al., 2015; Ruiz Morilla et al., 2017) and disagrees with others (Bouaud et al., 2006; Venkatesh et al., 2011) which found that other HCPs, especially physicians, encountered barriers to using electronic systems. These barriers are mostly based on environmental factors and system attributes (Ajami & Bagheri-Tadi, 2013).

Marital status and experience with using EHRs were found to be the main predictors of TAM among nurses during the Covid-19 pandemic. Nurses who have experience with using EHRs are thought to increase in confidence and to be more likely to adhere to policy (Abu Raddaha, 2018). This study found that marital status is one of the main predictors among participating nurses, differing from a previous study which found that the higher the educational level the higher the acceptance of EHRs (Salameh et al., 2019). A previous study in a Saudi Arabia hospital found that higher management, system quality, and educational level were predictors of acceptance of electronic records among nurses (Aldosari et al., 2018).

Statistical analysis indicated that no factors contributed to TAM in other HCPs. Previous studies have found that satisfaction, attitudes, organizational support, intention to use the system, and clinical practice guidelines were significantly associated with TAM before the Covid-19 pandemic (Holden et al., 2016; Hsiao & Chen, 2016). Additionally, a study in northwestern Ethiopia found several factors associated with EHRs, including effort and performance expectations (Ahmed et al., 2020). Several interruption factors have been identified among nurses, such as visitors and equipment failure, which may impede their acceptance of EHRs (Altamimi et al., 2022). The existential vacuum among nurses contributes to psychological burnout and to some extent affects their acceptance of electronic records (Alfuqaha et al., 2021). Therefore, it is necessary to identify this issue in future studies. Finally, we identified that perceptions of TAM among nurses and other HCPs do not necessarily reflect future preparedness and strategies for organizational development.

The present study was limited by its convenience sampling procedure, the period of the Covid-19 pandemic, and fact that only one hospital was selected. Finally, we recognize that the perceptions of TAM among nurses and HCPs do not reflect the nature of their work.

Conclusion

Healthcare providers exhibit higher perceived levels of TAM than nurses. During the Covid-19 pandemic the implementation and acceleration of use of EHRs might be expected to face certain obstacles, especially among nurses, due to the nature of their work. Planning and scheduling criteria should be considered to help nurses to accept TAM during the pandemic in Jordan. In this regard, the authors would first recommend that all HCPs and nurses continue to use EHRs in clinical practice. Second, an expert EHR trainer should be allocated to departments in order to provide internal training to HCPs and help them understand the new systems, making EHRs easier to use in clinical practice. Third, during the pandemic, EHRs are more targeted and, as a result, healthcare system managers need to provide appropriate interventions and strategies for EHR implementation. It is essential, reasonable, and cost-effective for the organization. Finally, online training courses will provide a more comprehensive, deeper understanding and eliminate pressure on all

HCPs. Further studies are recommended to measure other factors such as satisfaction and commitment levels with TAM among HCPs during the Covid-19 pandemic.

Ethical aspects and conflict of interest

The authors report no conflict of interest.

The authors were sought the permission from the Institution Review Boards of the Jordan University Hospital (No. 10/2020/9607) to allow the collection of data from nurses. Date: 10/June/2020.

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Author contributions

Conception and design (OA, MR), data collection (OAK, MA), data analysis and interpretation (OA, MR), manuscript draft (OAK, MA), critical revision of the manuscript (OA, MR), final approval of the manuscript (OA).

References

Abu Raddaha, A. H. (2018). Nurses' perceptions about and confidence in using an electronic medical record system. *Proceedings of Singapore Healthcare*, *27*(2), 110–117. https://doi.org/10.1177/2010105817732585

Ahmed, M. H., Bogale, A. D., Tilahun, B., Kalayou, M. H., Klein, J., Mengiste, S. A., & Endehabtu, B. F. (2020). Intention to use electronic medical record and its predictors among health care providers at referral hospitals, north-west Ethiopia, 2019: using unified theory of acceptance and use technology 2(UTAUT2) model. *BMC Medical Informatics and Decision Making*, *20*(1), 207. https://doi.org/10.1186/s12911-020-01222-x

Ajami, S., & Bagheri-Tadi, T. (2013). Barriers for adopting electronic health records (EHRs) by physicians. *Acta Informatica Medica*, *21*(2), 129–134. https://doi.org/10.5455/aim.2013.21.129-134

Aldosari, B., Al-Mansour, S., Aldosari, A., & Alanazi, A. (2018). Assessment of factors influencing nurses' acceptance of electronic medical record in a Saudi Arabia hospital. *Informatics in Medicine Unlocked*, *10*, 82–88. https://doi.org/10.1016/j.imu.2017.12.007

Alfuqaha, O., & Alsharah, H. (2018). Burnout among nurses and teachers in Jordan: a comparative study. *Archives of Psychiatry and Psychotherapy*, *2*(2), 55–65. https://doi.org/10.12740/APP/80168

Alfuqaha, O., Alkawareek, M., & Alsharah, H. (2019). Self-evaluation and professional status as predictors of burnout among nurses in Jordan. *PLOS ONE*, *14*(3), e0213935. https://doi.org/10.1371/journal.pone.0213935

Alfuqaha, O. A., Al-olaimat, Y., Abdelfattah, A. S., Jarrar, R. J., Almudallal, B. M., & Abu ajamieh, Z. I. (2021). Existential vacuum and external locus of control as predictors of burnout among nurses. *Nursing Reports*, *11*(3), 558–567. https://doi.org/10.3390/nursrep11030053

Al-Sghayer, M., AlSadi, M., & Abu Ghosh, Z. (2016). Electronic health records and health care in Jordan. *Electronic Health Solutions*. https://ehs.com.jo/publication/electronic-health-records-and-health-care-jordan

Altamimi, M. H., Alfuqaha, O. A., Baniissa, A. S., & Wala' T. AL-Maqbeh, W. T. (2022). Visitors and equipment failure as predictors of interruptions among nurses. *Central European Journal of Nursing and Midwifery*, *13*(2), 640–647. https://doi.org/10.15452/CEJNM.2021.12.0039

Bagot, K., Moloczij, N., Arthurson, L., Hair, C., Hancock, S., Bladin, C. F., & Cadilhac, D. A. (2020). Nurses' role in implementing and sustaining acute telemedicine: a mixed-methods, pre-post design using an extended technology acceptance model. *Journal of Nursing Scholarship*, *52*(1), 34–46. https://doi.org/10.1111/jnu.12509

Barzekar, H., Ebrahimzadeh, F., Luo, J., Karami, M., Robati, Z., & Goodarzi, P. (2019). Adoption of hospital information system among nurses: a technology acceptance model approach. *Acta Informatica Medica*, *27*(5), 305–310. https://doi.org/10.5455/aim.2019.27.305-310

Basak, E., Gumussoy, C. A., & Calisir, F. (2015). Examining the factors affecting PDA acceptance among physicians: an extended technology acceptance model. *Journal of Healthcare Engineering*, *6*(3), 399–418. https://doi.org/10.1260/2040-2295.6.3.399

Bouaud, J., Séroussi, B., Falcoff, H., & Venot, A. (2006). Design factors for success or failure of guideline-based decision support systems: an hypothesis involving case complexity. *Annual Symposium proceedings. AMIA Symposium*, *2006*, 71–75.

Chow, S., Chin, W., Lee, H., Leung, H., & Tang, F. (2012). Nurses' perceptions and attitudes towards computerisation in a private hospital. *Journal of Clincal Nursing*, *21*(11–12), 1685–1696. https://doi.org/10.1111/j.1365-2702.2011.03905.x

Claudio, D., Velázquez, M. A., Bravo-Llerena, W., Okudan, G. E., & Freivalds, A. (2015). Perceived usefulness and ease of use of wearable sensor-based systems in emergency departments. *IIE Transactions on Occupational Ergonomics and Human Factors*, *3*(3–4), 177–187. https://doi.org/10.1080/21577323.2015.1040559

Clegg, A., Bates, C., Young, J., Ryan, R., Nichols, L., Ann Teale, E., Mohammed, M. A., Parry, J., & Marshall, T. (2016). Development and validation of an electronic frailty index using routine primary care electronic health record data. *Age and Ageing*, *45*(3), 353–360. https://doi.org/10.1093/ageing/afw039

Conte, J. G., Chen, A., Cahill, T., Zhang, N. J., Battaglia, F., & Ong, K. R. (2019). Measuring the impact of certified electronic health record technology on cost, quality and

safety outcomes. *International Journal of Computational Medicine and Healthcare*, *1*(1), 88–100.

Davis, F. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319–340. https://doi.org/10.2307/249008

Denaxas, S. C., & Morley, K. I. (2015). Big biomedical data and cardiovascular disease research: opportunities and challenges. *European Heart Journal – Quality of Care & Clinical Outcomes*, *1*(1), 9–16. https://doi.org/10.1093/ehjqcco/qcv005

El-Kareh, R., Gandhi, T. K., Poon, E. G., Newmark, L. P., Ungar, J., Lipsitz, S., & Sequist, T. D. (2009). Trends in primary care clinician perceptions of a new electronic health record. *Journal of General Internal Medicine*, *24*(4), 464–468. https://doi.org/10.1007/s11606-009-0906-z

Joukes, E., de Keizer, N. F., de Bruijne, M. C., Abu-Hanna, A., & Cornet, R. (2019). Impact of electronic versus paper-based recording before ehr implementation on health care professionals' perceptions of EHR use, data quality, and data reuse. *Applied Clinical Informatics*, *10*(2), 199–209. https://doi.org/10.1055/s-0039-1681054

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate data analysis: pearson new international edition* (7 ed.). Essex: Pearson Education Limited.

Holden, R. J., Asan, O., Wozniak, E. M., Flynn, K. E., & Scanlon, M. C. (2016). Nurses' perceptions, acceptance, and use of a novel in-room pediatric ICU technology: testing an expanded technology acceptance model. *BMC Medical Informatics and Decision Making*, *16*(1), 145. https://doi.org/10.1186/s12911-016-0388-y

Hoque, M. R. (2016). An empirical study of mHealth adoption in a developing country: the moderating effect of gender concern. *BMC Medical Informatics and Decision Making*, *16*, 51. https://doi.org/10.1186/s12911-016-0289-0

Hsiao, J.-L., & Chen, R.-F. (2016). Critical factors influencing physicians' intention to use computerized clinical practice guidelines: an integrative model of activity theory and the technology acceptance model. *BMC Medical Informatics and Decision Making*, *16*(1), 3. https://doi.org/10.1186/s12911-016-0241-3

Kalayou, M. H., Endehabtu, B. F., & Tilahun, B. (2020). The applicability of the modified technology acceptance model (TAM) on the sustainable adoption of eHealth systems in resource-limited settings. *Journal of Multidisciplinary Healthcare*, *13*, 1827–1837. https://doi.org/10.2147/JMDH.S284973

Kamal, S. A., Shafiq, M., & Kakria, P. (2020). Investigating acceptance of telemedicine services through an extended technology acceptance model (TAM). *Technology in Society*, *60*, 101212. https://doi.org/10.1016/j.techsoc.2019.101212

Kowitlawakul, Y., Chan, S. W., Pulcini, J., & Wang, W. (2015). Factors influencing nursing students' acceptance of electronic health records for nursing education (EHRNE) software program. *Nurse Education Today*, *35*(1), 189–194. https://doi.org/10.1016/j.nedt.2014.05.010

Kruse, C. S., Kothman, K., Anerobi, K., & Abanaka, L. (2016). Adoption factors of the electronic health record: a systematic review. *JMIR Medical Informatics*, *4*(2), e19. https://doi.org/10.2196/medinform.5525

Menachemi, N., & Collum, T. H. (2011). Benefits and drawbacks of electronic health record systems. *Risk Management and Healthcare Policy*, *4*, 47–55. https://doi.org/10.2147/RMHP.S12985

Meyerhoefer, C. D., Sherer, S. A., Deily, M. E., Chou, S. Y., Guo, X., Chen, J., Sheinberg, M., & Levick, D. (2018). Provider and patient satisfaction with the integration of ambulatory and hospital EHR systems. *Journal of the American Medical Informatics Association*, *25*(8), 1054–1063. https://doi.org/10.1093/jamia/ocy048

Rafique, H., Almagrabi, A. O., Shamim, A., Anwar, F., & Bashir, A. K. (2020). Investigating the acceptance of mobile library applications with an extended technology acceptance model (TAM). *Computers & Education*, *145*, 103732. https://doi.org/10.1016/j.compedu.2019.103732

Ruiz Morilla, M. D., Sans, M., Casasa, A., & Giménez, N. (2017). Implementing technology in healthcare: insights from physicians. *BMC Medical Informatics and Decision Making*, *17*(1), 92. https://doi.org/10.1186/s12911-017-0489-2

Salameh, B., Eddy, L. L., Batran, A., Hijaz, A., & Jaser, S. (2019). Nurses' attitudes toward the use of an electronic health information system in a developing country. *SAGE Open Nursing*, *5*, 2377960819843711. https://doi.org/10.1177/2377960819843711

Shirinbayan, P., Salavati, M., Soleimani, F., Saeedi, A., Asghari-Jafarabadi, M., Hemmati-Garakani, S., & Vameghi, R. (2020). The psychometric properties of the Drug Abuse Screening Test. *Addiction & Health*, *12*(1), 25–33. https://doi.org/10.22122/ahj.v12i1.256

Tubaishat, A. (2018). Perceived usefulness and perceived ease of use of electronic health records among nurses: application of technology acceptance model. *Informatics for Health and Social Care*, *43*(4), 379–389. https://doi.org/10.1080/17538157.2017.1363761

Venkatesh, V., Zhang, X., & Sykes, T. A. (2011). "Doctors do too little technology": a longitudinal field study of an electronic healthcare system implementation. *Information Systems Research*, *22*(3), 523–546.

World Health Organization. (2020). *Coronavirus disease 2019 (COVID-19) situation report*. WHO, Geneva. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports

Yusoff, M. S. B. (2019). ABC of content validation and content validity index calculation. *Education in Medicine Journal*, *11*(2), 49–54. https://doi.org/10.21315/eimj2019.11.2.6

Zaman, N., Goldberg, D. M., Kelly, S., Russell, R. S., & Drye, S. L., (2021). The relationship between nurses' training and perceptions of electronic documentation systems. *Nursing Reports*, *11*(1), 12–27. https://doi.org/10.3390/nursrep11010002

