Original Research Article

Assessing primary health care readiness for electronic health record

Modhi S. Alsubaie and *Olfat A. Salem PhD

Abstract

[1]Sector one, Riyadh Health Cluster one, Ministry of Health. Saudi Arabia

[2]Department of Nursing Administration and Education, College of Nursing, King Saud University, Riyadh, Kingdom of Saudi Arabia / Nursing Administration Department, Faculty of Nursing, Egypt, Menofia University

*Corresponding Author's E-mail: osalem@ksu.edu.sa

Numerous challenges face healthcare systems in developing countries, which makes the implementation of Information and Communications Technologies difficult. The main objective of the current study is assessing healthcare providers' readiness to electronic health record implementation at primary health care centers in Riyadh through identifying the capacity for successful implementation and identifying the correlation between the capacity for successful implementation of the electronic health record in primary health care centers in Riyadh. This study utilized a cross-sectional descriptive correlational designed. The study was conducted in a Saudi college of nursing. The sample of the study consisted of 100 nursing personnel working at primary health care centers in (Riyadh) Saudi Arabia. The results of the study showed that the capacity to successfully implement the electronic health record at the primary health care centers in Riyadh was medium. There was no direct correlation between the capacity for successful implementation of the electronic health record in primary health care centers in Riyadh and any demographic variables.

Keywords: Electronic health record, Primary health care, Readiness

INTRODUCTION

Healthcare is considered as a comprehensive term that has been used to describe the varied medical services being provided to patients to cater their demands. The quality of health care system depends on the quality of services being provided by it and the methods and techniques used to carrying out varied functions.

Considering the situation in healthcare organizations nowadays, it can be said that there is a real need for transition from reactive, doctor-centered approach to patient-centered approach that delivers accessible and high-quality care. Here, the use of health information technology (HIT) is seen as a crucial element to this transformation process (Cresswell and Sheikh, 2015). In a report Issued by World Health Organization (2017), The implementation of HIT is importance in order to ensure that healthcare information is safely provided to the right person at the right time and guarantee healthcare quality, accessibility and efficiency. The past 20 years have

witnessed great advances in healthcare information technology, which in fact has paved the way for the introduction of electronic records to overcome shortcomings associated with the use of paper-based records (Ajami, Ketabi, Isfahani and Heidari, 2011). Paper-based records have caused many problems in healthcare organizations, especially at the levels of storage, inaccessibility and illegibility (Alghamdi, 2015).

The significance of electronic health record systems emerges from the fact that they have the ability to improve the quality of health services through the availability and accessibility of health information any time to be accessed and used by authorized persons when needed (Gesulga et al., 2017).

In addition, Electronic Health Records (EHRs) provide real opportunities to develop performance measures and facilitate clinical research. Thus, they may assist in the assessment of the effectiveness of new treatments or

evaluation of innovative practices in healthcare (Cowie et al., 2017). The study of Gagliardi and Turner (2016) has revealed that EHRs" have become ubiquitous in the health care environment and bring with them the potential ability to monitor metrics as well as the promise of a variety of safety measures" (p. 325). Countries around the world seek to adopt EHR systems to develop health related management processes and patient safety at reasonable costs (World Health Organization, 2017). Accordingly, adoption of EHRs and their role in cost savings cannot be ignored as a critical factor in changing and transforming the delivery of health care (Hiller et al., 2011). Although EHRs are being implemented in many healthcare institutions to provide effective and efficient data processing, their evaluation has received little attention (El.Mahalli, 2015). Readiness assessment helps in providing a comprehensive image of the varied variables that may facilitate or hinder successful implementation of electronic health record (Ghazisaeidi et al., 2013).

In consistent with the idea mentioned above, one can say that assessing readiness will enable healthcare providers identify barriers that might hinder the adoption of EHR system (Gesulga et al., 2017). In addition, a study conducted by Gholamhosseini and Ayatollahi (2017) has revealed that it has become of utmost importance to assess hospitals e-health readiness to save time, effort and money and prepare all healthcare providers for Information and Communications Technologies (ICT). Implementing electronic record initiatives in healthcare has the ability to positively improve healthcare quality, increase accessibility to patient records, and develop governance techniques. Before implementation, it is recommended to conduct E. Readiness Assessment to evaluate the likelihood of successful adoption. E-readiness plays a critical role in assessing the weaknesses the organization must overcome for successful adoption in the pre-implementation phase (Stadelmann, 2012; Adjorlolo and Ellingsen, 2013).

Despite the fact that electronic medical record systems are implemented to support healthcare services, its adoption rate in many countries remains low, especially in developing countries due to constraints associated with technological, financial, and organizational aspects. There are also some issues regarding the healthcare providers' pre implementation readiness (Biruk et al., 2014).

Governments in various countries are planning to implement and integrate EHRs at the national level rather than depending on local initiatives of EHRs in different healthcare organizations. At the level of the Kingdom of Saudi Arabia (KSA), we can notice that the Kingdom has lagged behind significantly in this regard, as only few hospitals have implemented this technology (Alqahtani et al., 2017).

In addition, hospitals under the Ministry of Health within the Kingdom have no EHR plans or schemes. On the contrary, they are totally dependent either on paper files or basic software tools to conduct daily functions such as patient admissions (Alanazy, 2006). In a study conducted by Alqahtani et al. (2017), the results have revealed that there are certain barriers to EHR adoption, these barriers can be represented in lack of computer experience, lack of perceived usefulness, software limitations, lack of user support, confidentiality issues, resistance to change, lack of quality in patients' information and lack of EHR standards.

In consistent with what have been mentioned, Alghamdi (2015) has revealed that lack of experience with the use of computer, security concerns, high costs of adopting and resistance to change have been considered as main factors that hinder the implementation of EHRs in Saudi Arabia healthcare systems. The study of Abu Raddaha (2017) has confirmed that little is known about nurses' perceptions towards electronic health record (EHR) systems in healthcare organizations. The study conducted by Habibi-Koolaee et al. (2015) have revealed that it is important to assess nurses' readiness to adopt electronic health records in clinical settings through specialized training programs. Also, the study of Al-Mansour, Aldosari and Alanazi (2018)have confirmed that perceived usefulness and perceived ease of use positively affect nurses acceptance of electronic medical record systems in Saudi Arabia hospitals.

Objectives of the Study

The main objective of the current study is assessing healthcare providers' readiness to electronic health record implementation at primary health care centers in Riyadh, Saudi Arabia.The aim will be attained through:
1. Identifying the capacity for successful implementation of electronic health record at primary health care centers in Riyadh.
2. Identifying the correlation between the capacity for successful implementation of the electronic health record in primary health care centers in Riyadh and the study demographic variables.

METHODOLOGY

Research Design

A quantitative, Cross-sectional descriptive correlational design was used in this study.

Study settings

The study was conducted at primary health care centers, in Riyadh, Kingdom of Saudi Arabia.

Table 1. The correlation coefficients of phrase to the total score of the questionnaire

Correlation coefficient	Item	Correlation coefficient	Item
0.713**	11	0.274**	1
0.642**	12	0.274**	2
0.828**	13	0.495**	3
0.805**	14	0.643**	4
0.618**	15	0.634**	5
0.758**	16	0.646**	6
0.673**	17	0.673**	7
0.596**	18	0.707**	8
0.486**	19	0.812**	9
0.704**	20	0.687**	10

Subjects

Participants were a convenience sample of 100 nurses who were recruited from the primary health care centers, in Riyadh, Kingdom of Saudi Arabia.

Study tool

For collecting data, and after reviewing the pertaining literature, a survey will be adopted after obtaining the official permissions from the author (Cherry, 2011). Certain selected personal and professional characteristics of the participants will be added as needed to fulfill the study objectives.

A bilingual primary care physician who is Arabic-English speaker had translated the Electronic Health Record (EHR) Organizational Readiness Tool into Arabic. Back translation was performed by another professional bilingual primary care physician. The Arabic version of the questionnaire was piloted on five native Arabic speaking physicians to test the feasibility and applicability of the tool. To check the content validity of the questionnaire, Pearson's correlation coefficient was used to measure the relationship between the phrases and the total score of the questionnaire. Table (1) shows that all correlation coefficients between each phrase and the total score of the questionnaire were positive and statistically significant at the level (0.01).

To check the reliability of the questionnaire, Cronbach's alpha coefficient was used, the value of the questionnaire is a high value (0,923), which assures that the questionnaire has a high level of consistency

Ethical Considerations

Official approval taken from the administration of the selected setting. Primary health care centers, in Riyadh, Kingdom of Saudi Arabia. Before using questionnaire, the researcher obtained permission from the authors. The Research and Ethics committee approved the study protocol. All principles of ethics in research were followed. The data collection tool had a cover page that explained the aim of the study and the participant's rights to withdraw from the study at any stage without any penalty, participation was voluntary, and there were no apparent risks for the participants, confidentiality, anonymity, and the use of their information solely for research. Each participant was then asked to sign the form as consent to participate

Data Analysis

Data will be categorized, coded and analyzed using Statistical Package for Social Sciences program (SPSS-22). Descriptive statistics will be used to describe the sample major variables in sort of mean, standard deviation, frequency, and percentage. While inferential statistics will be used to figure out the correlations among the study variables.

RESULTS

Characteristics of the Research Sample

Table 2 shows frequency distribution of demographic characteristics of participants. The majority of the nurses (41%) ranged between 31 to 40 years old, while only 4 % of the nurses were 50 years and up. The majority of the sample was females (78%) while only 22% were males. The majority of the sample was Saudi nurse (98%) while only (2%) were non-Saudi. About two thirds (78%) of the sample had diploma degrees and one-third (22%) of the sample had bachelor degrees. More than one quarter (39%) of the sample had 16 and above years of experience.

The capacity for successful implementation of electronic health record (HER) at primary health care centers in Riyadh

Table 3 shows the arithmetic mean, standard deviations

Table 2. Frequency Distribution of Demographic Characteristics of Participants (N= 100)

Demographic Characteristics		Frequency	Percent
Gender	Male	22	22.0%
	Female	78	78.0%
Age	20-30	33	33.0%
	31-40	41	41.0%
	41-50	22	22.0%
	50 and above	4	4.0%
Education level	Diploma	78	78.0%
	Bsc	22	22.0%
Years of Experience	1-5	28	28.0%
	6-10	21	21.0%
	11-15	12	12.0%
	16 and above	39	39.0%
Nationality	Saudi	98	98.0%
	Non-Saudi	2	2.0%
Total	Total	100	100.0%

Table 3. The arithmetic averages, standard deviations, approval scores, and order of the resolution terms (N=100)

No	Items	Mean	SD	scores	order
1	leadership is strongly supportive of EHR implementation	5.68	2.296	great	1
3	Employees are willing to engage in the process of EHR implementation	5.20	2.466	great	2
2	Mission and strategic plan support the move to EHRs	5.05	2.376	great	3
4	Employees have a positive attitude toward EHR implementation	5.06	2.123	great	4
13	Implementation plans include a method to convert paper records to electronic data	4.13	2.264	medium	5
14	Implementation plans include approaches to gain buy-in from the staff	3.87	2.234	medium	6
19	Physical plant can be retrofitted for Internet connectivity	3.81	2.343	medium	7
15	Implementation plans detail initial and ongoing training programs	3.41	2.347	medium	8
12	Representatives from across departments and levels will be involved in HER implementation	3.40	2.256	medium	9
18	Physical space for the required (hardware computers, monitors, etc.) is adequate	3.24	2.204	medium	10
9	Employees with knowledge and willingness to lead project implementation are available	3.22	2.529	medium	11
11	Project implementation leaders have expertise in system selection	3.19	2.127	medium	12
16	Implementation plan includes an evaluation component	2.74	2.435	low	13
20	State regulatory survey team supports the transition to EHRs	2.68	2.636	low	14
8	EHR products that meet specific needs of licensed nursing facilities are available	2.66	2.442	low	15
7	Financial resources for initial and on-going EHR training are adequate	2.60	2.441	low	16
5	Financial resources to support EHR start-up costs are adequate	2.38	2.432	low	17
6	Financial resources to support on-going EHR costs are adequate	2.34	2.395	low	18
17	Technical support to maintain the EHR system is available	2.34	2.184	low	19
10	Well-defined implementation plan has been developed	2.23	2.169	low	20
	Total	3.23	1.475	Medium	

Table 4. Relationship between demographic variables and the capacity for successful implementation of electronic health record (HER)at primary health care centers in Riyadh

Demographic variable	Capacity for successful implementation	
	Coefficient of correlation	Level of significance
Gender	0.115	0.255
Age	0.109-	0.282
Education	0.005	0.964
Years of Experience	0.036-	0.719
Nationality	0.029	0.771

and approval scores for descending order conditions. The mean values ranged between (2.23 - 5.68), while items (1, 3, 2, 4), which obtained great approval scores, the highest of them was the item (1) (leadership is strongly supportive of EHR implementation) that obtains the highest mean, its value reached (5.68), while items (13, 14, 19, 15, 12, 18, 9, 11) obtained medium approval grades. The remainder of items obtained lower degrees of approval, but the lowest item was no. (10) (Well-defined implementation plan has been developed), its mean value reached (2.23).

The table also shows that the mean average of total number of items reached (3.47) with a moderate approval score. This indicates that the capacity to successfully implement the electronic health record at the primary health care centers in Riyadh was medium.

The relationship between demographic variables and the capacity for successful implementation of electronic health record (HER) at primary health care centers in Riyadh

Table (4) shows that the value of the significance level was greater than (0.05). This means that there is no direct correlation between the capacity for successful implementation of the electronic health record in primary health care centers in Riyadh and any demographic variables.

DISCUSSION

The adoption of EHRs has the ability to enhance healthcare efficiency, improve healthcare quality and reduce costs (Gesulga et al., 2017; Cowie et al., 2017; Seymour et al., 2012; World Health Organization, 2006; El-Masri and AlJarullah, 2013; Rasmussen, 2014; Alnuem et al., 2011). The result of the study obtained the highest means was the phrase no. (1) (Leadership is strongly supportive of EHR implementation). This in fact goes in harmony with Hasanain et al. (2015) who confirmed that healthcare administrators should provide the staff with real opportunities of training and educational programs to enable them identify how to deal with these systems and make full use of them. Phrase

(14) "Implementation plans include approaches to gain buy-in from the staff", phrase (15) "Implementation plans detail initial and ongoing training programs" and phrase (16) "Implementation plan includes an evaluation component" have obtained medium approval grades and have confirmed the importance of planning for successful implementation of EHRs. This is consistent with what have been confirmed by Alqahtani et al. (2017) who have revealed that governments around the world are planning to implement and integrate EHRs within their healthcare systems. On the contrary, Alanazy (2006) have showed that hospitals under the Ministry of Health within the Kingdom have no EHR plans or schemes. Phrase (18) "Physical space for the required (hardware computers, monitors, etc.) is adequate" is consistent with what have been mentioned by Seymour et al. (2012) who have confirmed that EHRs largely depend on software, hardware, and IT infrastructure. In addition, Alghamdi (2015) has confirmed that lack of computers and other devices hindered the effective implementation of EHRs. Tang and McDonald (2006) have also confirmed that the use of computers is considered as a must for the effective implementation of EHRs.

The results of the current study show that the capacity to successfully implement the electronic health record at the primary health care centers in Riyadh was medium. There was no direct correlation between the capacity for successful implementation of the electronic health record in primary health care centers in Riyadh and any demographic variables. This result is not consistent with Jabali and Jarrar (2018) who revealed that the overall functionalities of the HER in healthcare institutions within the Kingdom of Saudi Arabia were low. The researcher attributed this result to the viewpoint that healthcare providers within primary healthcare centers in Riyadh have not yet developed the skills and competencies needed to successfully implement the electronic health record.

Future Challenges

Adoption and acceptance of electronic health records within the Kingdom of Saudi Arabia is not an easy task, as it requires all healthcare providers to train on how to make full use of these systems in developing all healthcare processes in an attempt to improve the quality

of services being provided to Saudi citizens. Healthcare administrators should do their best in order to provide the healthcare staff with the competencies for successful implementation of the electronic health records in primary health care centers. Periodic assessments should be conducted for successful adoption of EHRs before the actual implementation of the system.

CONCLUSION

Improving the quality of services within the Kingdom of Saudi Arabia has become necessary in order to develop the quality of the sector as a whole. Embedding information technology represented in EHRs can save time, efforts and costs which in fact will have their positive effects on the quality of services being provided to all patients within the Kingdom. The researcher recommends conducting comparative studies to compare levels of adoption among healthcare providers who are working in public and private healthcare centers in Saudi Arabia. Similar studies should be conducted in order to identify factors that hinder the effective implementation of EHRs. The researcher also recommends providing training programs for healthcare providers to enable them develop their IT competencies.

Conflict of Interest statement

The authors report no conflict of interest.

REFERENCES

Abu Raddaha AH (2017). Nurses' characteristics and perceptions toward using the electronic health record system as predictors of clinical nursing performance improvement. *Clinical Nursing Studies, 5*(4), 32-41.

Adjorlolo S, Ellingsen G (2013). Readiness Assessment for Implementation of Electronic Patient Record in Ghana: A case of University of Ghana Hospital. *J. Health Informatics in Developing Countries [JHIDC], 7*(2), 1-4.

Ajami S, Ketabi S, Isfahani SS, Heidari A (2011). Readiness Assessment of Electronic Health Records Implementation. *ACTA INFORM MED, 19*(4), 224-227.

Alanazy S (2006). *Factors Associated With Implementation Of Electronic Health Records In Saudi Arabia* (Unpublished Doctor Dissertation), University Of Medicine And Dentistry Of New Jersey, USA.

Alghamdi ASM (2015). *Factors associated with the implementation and adoption of electronic health records (EHRS) in Saudi Arabia* (Unpublished Doctor Dissertation), State University of New Jersey, USA.

Al-Mansour S, Aldosari B, Aldosari H, Alanazi A (2018). Assessment of factors influencing nurses acceptance of electronic medical record in a Saudi Arabia hospital. *Informatics in Medicine Unlocked 10*(2018), 82–88.

Alnuem M, EL-Masri S, Youssef A, Emam A (2011). Towards Integrating National Electronic Care Records in Saudi Arabia. International conference on bioinformatics and computational biology Monte Carlo Resort, Las Vegas, Nevada, USA.

Alqahtani A, Crowder R, Wills G (2017). Barriers to the Adoption of EHR Systems in the Kingdom of Saudi Arabia: An Exploratory Study Using a Systematic Literature Review. *J. Health Info. Develop. Countries, 11*(2), 1-23.

Biruk S, Yilma T, Andualem M, Tilahun B (2014). Health Professionals' readiness to implement electronic medical record system at three hospitals in Ethiopia: a cross sectional study. *Medical Informatics and Decision Making*, 2014, 1-8.

Cherry B (2011). Assessing organizational readiness for electronic health record adoption in long-term care facilities. J GerontolNurs. 2011 Oct;37(10):14-9. doi: 10.3928/00989134-20110831-06. Epub 2011 Sep 16.

Cowie MR, Blomster JI, Curtis LH, Duclaux S, Ford I, Fritz F, Goldman S, Janmohamed S, Kreuzer J, Leenay M, Michel A, Ong S, Pell JP, Southworth MR, Stough WG, Thoenes M, Zannad F, Zalewski A (2017). Electronic health records to facilitate clinical research. *Clin Res Cardiol, 106*(2017), 1-9.

Cresswell KM, Sheikh A (2015). Health information technology in hospitals: current issues and future trends. *Future Hospital Journal, 2*(1), 50-56.

El.Mahalli A (2015). Adoption and Barriers to Adoption of Electronic Health Records by Nurses in Three Governmental Hospitals in Eastern Province, Saudi Arabia. *Perspectives in Health Information Management*, 2015, 1-16.

El-Masri S, AlJarullah A (2013). A Novel System Architecture for the National Integration of Electronic Health Records: A Semi-Centralized Approach. *J Med Syst.,* (2013), 1-20.

Gagliardi JP, Turner DA (2016). The Electronic Health Record and Education: Rethinking Optimization. *J. Grad. Med. Edu.* 2016, 325-327.

Gesulga JM, Berjame A, Moquiala KS, Galido A (2017). Barriers to Electronic Health Record System Implementation and Information Systems Resources: A Structured Review. *Procedia Computer Science, 124*(2017), 544–551.

Ghazisaeidi M, Ahmadi M, Sadoughi F, Safdari R (2013). An Assessment of Readiness for Pre-Implementation of Electronic Health Record in Iran: a Practical Approach to Implementation in general and Teaching Hospitals. *Acta MedicaIranica, 52*(7):532-544.

Gholamhosseini L, Ayatollahi H (2017). The design and application of an e-health readiness assessment tool. *Health Info. Manag. J. 46*(1) 32–41.

Habibi-Koolaee M, Safdari R, Bouraghi H (2015). Nurses Readiness and Electronic Health Records. *ACTA INFORM MED., 23*(2), 105-107.

Hasanain RA, Vallmuur K, Clark M (2015). Electronic Medical Record Systems in Saudi Arabia: Knowledge and Preferences of Healthcare Professionals. *J. Health Info. Develop. Countries, 9*(1), 23-31.

Hiller J, Mcmullen MS, Chumney WM, Baumer DL (2011). Privacy and security in the implementation of health information technology (electronic health records): U.S. And EU compared. *B.U. J. SCI. & TECH. L., 17*(2011), 1-40.

Jabali AK, Jarrar M (2018). Electronic Health Records Functionalities in Saudi Arabia: Obstacles and Major Challenges. *Glo. J. Health Sci. 10*(4), 50-57.

Rasmussen LV (2014). The Electronic Health Record for Translational Research. *J Cardiovasc Transl Res., 7*(6), 607–614.

Seymour T, Frantsvog D, Graeber T (2012). Electronic Health Records (EHR). Ame. J. Health Sci. 3(3), 201-210.

Stadelmann J (2012). *Public Policy and Administration Department* (Unpublished Master Dissertation), The American University in Cairo, Cairo.

Tang PC, Mcdonald CJ (2006). Electronic Health Record Systems. In Shortliffe, E. H., & Cimino, J. J., *Biomedical Informatics Computer Applications in Health Care and Biomedicine* (3rd Eds.,), USA: Library of Congress

World Health Organization. (2006). *Electronic Health Records: Manual for Developing Countries*. WHO Library Cataloguing in Publication Data

World Health Organization. (2017). Handbook for Electronic Health Records Implementation.