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The Role of Electronic Health Records in Improving Communication Between Health Professionals in Primary Healthcare Centres in Riyadh: Perception of Health Professionals

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Abstract

Improving communication among healthcare providers is one of the critical components of safe and quality patient care. The study objective is to examine how occupation and training of health professionals in Riyadh, Saudi Arabia influence professionals' perception of the role of electronic health records (EHRs) in improving communication between healthcare providers in primary healthcare centres. A survey-based study method employing a descriptive, cross-sectional design was used. Health professionals' occupation and training were found to influence their perception of the role of the EHR in improving interprofessional communication. Physicians and professionals with training on EHRs had the highest rating for the system's role in improving communication between healthcare professionals. All healthcare providers should embrace EHR systems in their practice to promote interprofessional communication and collaboration in the patient care process.

Keywords:

Electronic health records, Primary health care, Health personnel

Introduction

Effective communication among health professionals is crucial for the improvement of patient safety, and outcomes with ineffective communication noted to result in several adverse events such as medical errors that put patient's life at risk [1]. Electronic health records (EHRs) have been demonstrated to be useful systems for improving communication not only among the healthcare providers themselves but also between patients and their caregivers [2-5]. In promoting the exchange of patient's health information among providers, the EHR creates an opportunity for care coordination between health professionals and medical departments that enhances the provision of safe and quality patient care marked with reduced medical errors and other adverse events [6].

Despite the implementation of EHR systems resulting in these benefits due to improved communication, it has been established that sufficient communication among healthcare providers is still a challenge in the healthcare system with much focus having been placed on provider-patient interaction more than in communication between physician and professional colleagues [7]. The challenge is even bigger in Saudi Arabia where English is a second language but considered the official language used in communication in Saudi healthcare organisations. In addition, the Saudi healthcare organisations have health professionals from all around the world with different backgrounds and of course different mother tongue languages. Most of the research on the EHR role in improving healthcare outcomes has also only been reported in western countries with little evidence in the Saudi context. This could be due to the low adoption of EHR systems in Saudi Arabia due to various factors such as lack of perceived usefulness by the health professionals and hospital size [8]. To the best of the authors' knowledge, there are no previous studies that have discussed the role of the EHR in improving communication in Saudi Arabia especially from the perceptions of health professionals in primary health care (PHC). Factors influencing the use of EHRs by healthcare providers in these settings have also not been adequately investigated. Therefore, this study aimed to evaluate the perceptions of health professionals in relation to their occupation and training on the role of EHRs in improving communication among healthcare providers for better patient care in primary health care centers (PHCCs) in Riyadh, Saudi Arabia. In so doing, the study had three specific objectives: 1) to investigate the healthcare professionals' perception towards the EHR role in improving communication between healthcare providers, 2) to investigate the correlation between the occupation of health professionals and perception of use of EHRs in improving communication between health professionals, and 3) to investigate the relationship between training on EHRs and perception of use to improve communication between health professionals.

It was hypothesized that several factors could influence the users' perception and use of the EHR to facilitate communication with colleagues. In this study, the occupation of the healthcare professionals in Saudi primary care and training on EHR systems were expected to influence the professionals' perception of the role of the EHR in improving communication among health practitioners.

Methods

This cross-sectional study was designed to investigate the perception of healthcare professionals working in PHCCs in Riyadh city on the role of EHRs in improving communication among health professionals leading to high-quality and safe healthcare in relation to the professionals' occupation and training on EHRs.

Study setting and sample

The study was conducted in Riyadh City which has the highest number of PHCCs since it is the capital of Saudi Arabia. The region has 1710 healthcare professionals comprising physicians,

nurses, pharmacists, laboratory technicians and those from allied health professions such as physiotherapists working in PHCCs [9]. Therefore, a survey involving all the healthcare professionals was undertaken to evaluate their perceptions on the role of EHRs in regards to the quality of service provision. This population was chosen because they interact with EHR on a daily basis and are considered to be in the best position to gauge the application of these tools in the provision of care. Other employees in the primary health care sector in Riyadh falling in various categories such as clerks, drivers, office assistants, administrative personnel, and any other group of supporting staff were not included in the study.

Instruments

The data collection instrument was an online-based questionnaire using Research Electronic Data Capture (REDCap) to ensure the participants' convenience. The questionnaire included both closed and open-ended questions. It was adapted from the survey tool developed by Secginli and peers to evaluate the perception of Turkish healthcare professionals towards the EHR in Family Health Centres (FHCs) which are primary health care settings [10]. The tool had 14 statements related to EHR benefits of which "improves communication between health professionals" was one of them. In addition, it had 9 items for perceived obstacles to implementing the EHR in PHCCs and 10 related to the quality of healthcare services due to the use of EHR in PHCCs. The measurements were based on a Likert scale of 1 to 5 representing strongly disagree to strongly agree. The survey tool was tested for reliability and validity using a pilot study done online in the same way it was to be used in the actual study. This pilot test involved 23 participants drawn from the same population with the sample illustrating a normal distribution with Cronbach's alpha of 0.828 and 0.969 for the combined 23 items for perceived benefits and obstacles, and 10 items for quality of health services respectively compared to the total population as shown in Table 1. The validity of the results was enhanced by including the entire population in the study which improves the response rate. For clarity, the questions in the questionnaire were carefully worded and properly ordered to eliminate any form of ambiguity or bias.

Table 1 – Reliability Tests

Dimension	Cronbach's alpha	No of items
EHR benefits and obstacles to implementation	0.828	23
Quality impact on healthcare services	0.969	10

Data collection procedures and ethical issues

The data was collected for a period of two months, that is between 30th November 2017 and 30th January 2018. All the healthcare professionals working in PHCCs in Riyadh City were invited, through the General Directorate of Health Affairs in Riyadh Region and Human Resource (HR) departments in each of the PHCCs, to complete the survey that was made available in an online format using REDCap for the participants' convenience. The participation was entirely voluntary and by completing the survey, one was considered to have given informed consent. After completing the survey, the data was retrieved from the database for analysis. The study was approved by the University of Tasmania Social Science Human Research Ethics Committee and the Ministry of Health of Saudi Arabia.

Data analysis procedure

The Statistical Packages for Social Sciences (SPSS) (version 20) was used for data analysis. Descriptive statistics were mainly calculated for demographics and overall responses, and they included frequencies, percentages and means. A chi-square test of independence was used to determine the relationship between the healthcare professionals' perceptions of EHR benefit in improving inter-professional communication with respect to their occupation or previous training on EHR. The p-value was set at 0.05.

Results

Participants' characteristics

Out of the 1710 questionnaires distributed, 1127 were returned and found to be eligible for analysis. This represents a response rate of 66%. Most of the respondents were nurses representing 32.6% of the sample. Majority of the respondents (72%) were Saudi nationals. Female health professionals also comprised more than half of the health professionals representing 55.4%. The majority were 20 – 34 years old and had worked for less than 10 years or less in PHCCs in Riyadh. Moreover, almost 60% had no previous experience outside Saudi Arabia, training on EHR and experience on EHR in primary healthcare. This data is presented in Table 2.

Table 2 – Demographic Data of the Whole Population (n = 1710) and the Respondents (n = 1127)

Demographic characteristics		All (N = 1710) n (%)	Respondents (N = 1127) n (%)	Response rate per demographic (%)
Occupation	Physician	369 (21.5)	209 (18.5)	56.6
	Nurse	543 (31.7)	367 (32.6)	67.6
	Pharmacist	256 (14.9)	208 (18.5)	81.3
	Technician	368 (21.5)	228 (20.2)	62.0
	Other	174 (10.1)	115 (10.2)	66.0
Gender	Male	795 (46.5)	503 (44.6)	63.3
	Female	915 (53.5)	624 (55.4)	68.2
Nationality	Saudi	1103 (64.5)	811 (72.0)	73.5
	Non-Saudi	607 (35.5)	316 (28.0)	52.0
Age	20 - 34	803 (47.0)	608 (53.9)	75.7
	35 – 49	665 (38.9)	471 (41.8)	70.8
	50+	242 (14.2)	48 (4.3)	19.8
Length of working years in PHCCs in Riyadh	0 – 10	1065 (62.2)	870 (77.2)	81.7
	11-20	420 (24.6)	226 (20.1)	53.8
	21+	225 (13.2)	31 (2.8)	13.8
Previous health experience outside Saudi Arabia	No	978 (57.2)	686 (60.9)	70.1
	Yes	732 (42.8)	441 (39.1)	60.4
Previous training on EHR in primary healthcare	No	966 (56.5)	674 (59.8)	69.8
	Yes	744 (43.5)	453 (40.2)	60.9
Previous EHR experience in primary healthcare	No	978 (57.2)	686 (60.9)	70.1
	Yes	732 (42.8)	441 (39.1)	60.2

Perceptions of healthcare providers about the benefits of EHR systems

The majority of healthcare providers perceived EHR systems to be useful in improving communication between health professionals with the statement having a high agreement level of 73.6% as shown in both Tables 3 and 4. On an average scale, the statement had a mean agreement level of 2.65 (Standard deviation = 0.63, range: 2.61 - 2.69) at 95% confidence level.

Correlation between perceptions of EHR role in improving communication and health professional's occupation

There was a significant difference between health professional's perception of EHR role in improving communication between health professionals and other benefits in general ($p<0.0001$). Physicians had the highest agreement level of 83.7% with EHR benefit in improving communication between healthcare providers compared to other professionals. They were followed by pharmacists, nurses, other professions and lastly technicians with an agreement level of 63.2%. This data is presented in Table 3.

Table 3 – Correlation between Perceptions of EHR Benefits and Occupation Categories

Benefit variable	**Occupation**						
	Total	**Physicians**	**Nurses**	**Pharmacists**	**Technicians**	**Others**	**p-value**
Agreement level	**%**	**%**	**%**	**%**	**%**	**%**	
Provides quick and reliable access to scientific research	76.0	89.5	79.0	79.3	63.6	60.0	<0.05
Enables easy access to information from past medical records	73.9	86.6	76.8	75.5	61.4	63.5	<0.05
Provides access to patient data and analysis	76.8	91.4	77.4	80.8	65.4	64.3	<0.05
Provides better data	74.5	89.0	74.7	76.9	62.7	67.0	<0.05
Makes it easy to transfer data	74.4	85.6	73.0	78.8	66.2	66.1	<0.05
Provides access to practice standards	73.6	86.6	74.4	75.0	63.2	65.2	<0.05
Enables following test results	75.3	86.1	77.7	78.8	62.7	67.0	<0.05
Saves time in documenting health data	75.2	83.7	76.8	78.4	66.7	66.1	<0.05
Decreases paper-based documentation	77.1	89.5	78.5	79.3	67.5	65.2	<0.05
Improves the feeling of professionalism	76.2	85.6	77.7	79.3	66.2	68.7	<0.05
Improves communication between health professionals and patients	73.7	83.7	74.4	78.4	64.0	64.3	<0.05
Contributes to health professionals 'ability to make patient care decisions	72.3	81.8	73.6	73.6	64.0	65.2	<0.05
Improves communication between health professionals	**73.6**	**83.7**	**74.9**	**76.9**	**63.2**	**65.2**	**<0.05**
Reduces medical errors	63.5	73.7	65.5	63.0	54.4	58.3	<0.05

Correlation between perceptions of EHR role in improving communication between health professionals and training

A significant difference was found in the perception of the EHR role in improving communication between healthcare professionals with training on the EHR and those without. Approximately 81% of the health professionals with previous training on the EHR and its benefits agreed that the EHR improves communication among healthcare providers compared to about 69% who did not have any previous training as shown in Table 4.

Table 4 – Correlation between Perceptions of EHR Role in Improving Communication and Health Professionals' Training in EHRs

Benefit variable	**Previous training on EHR in primary healthcare**			
	Total	**No**	**Yes**	**p-value**
Agreement level	**%**	**%**	**%**	
Provides quick and reliable access to scientific research	76.0	70.8	83.7	<0.001
Enables easy access to information from past medical records	73.9	68.5	81.9	<0.001
Provides access to patient data and analysis	76.8	71.7	84.5	<0.001
Provides better data	74.5	71.8	78.6	<0.001
Makes it easy to transfer data	74.4	69.9	81.0	<0.001
Provides access to practice standards	73.6	68.7	80.8	<0.001
Enables following test results	75.3	70.6	82.3	<0.001
Saves time in documenting health data	75.2	70.3	82.6	<0.001
Decreases paper-based documentation	77.1	72.6	83.9	<0.001
Improves the feeling of professionalism	76.2	69.9	85.7	<0.001
Improves communication between health professionals and patients	73.7	69.3	80.4	<0.001
Contributes to health professionals 'ability to make patient care decisions	72.3	67.7	79.2	<0.001
Improves communication between health professionals	**73.6**	**68.7**	**80.8**	**<0.001**
Reduces medical errors	63.5	59.6	69.3	0.002

Discussion

The aim of this study was to investigate the influence of health professionals' occupation and training in EHRs on the perceived role of EHR systems in improving communication between health professionals in Saudi PHCCs.

The findings suggest that healthcare providers consider EHRs to play a key role in the provision of healthcare in primary healthcare. Moreover, the study shows that the occupation of healthcare providers as well as their training in the EHR determine how they perceive EHR benefits including improving communication among healthcare professionals.

In general, the majority of all healthcare providers agreed that EHRs have benefits in improving communication among healthcare teams. Previous studies have also shown that the majority of the health care providers perceive the EHR to be useful in improving provider-provider interactions [3; 6]. This might be due to their experience in interacting with EHR systems at different levels of care including diagnosis, posting lab results, ordering and issuing of prescriptions. However, it could also be a common belief that such systems are effective in improving communication due to their interlinked nature of different departments in a hospital or organisational setting that allows sharing of patient's medical information. EHRs could be critical in these scenarios by providing the patient's medical and treatment history where a particular intervention is required [4]. It has been observed that EHRs serve as an important platform for sharing of patient information to guide the provision of better care that could significantly improve the efficiency and safety of health care and result in cost savings [11]. Gordon and colleagues also asserted that there is a need for effective communication among members of a healthcare team to not only improve the quality of patient care but also to reduce costs of treatment as well as improve patient experience [2; 12].

The benefits of EHRs in improving communication among health professionals were perceived most by physicians, pharmacists, and nurses. This could be explained by the close working relationships of these three categories of professions. They usually interact in many areas of patient care including diagnosis of diseases and prescription by the physician, drug selection and monitoring by the pharmacist, and administration and monitoring by the nurse. Hence, the need for constant communication. Vitari and Ologeanu-Taddei similarly showed in their study that the intent of use of EHRs varied among three categories of clinical staff including physicians, paraprofessionals, and administrative staff with physicians having a higher intent mainly due to professional autonomy and medical responsibility [13]. Another study involving health workers in Central Malawi similarly found that job title influenced EHR usage; however, its finding showing that about two-thirds of the clinicians preferred paper-based records to electronic ones was surprising [14].

Those who have training in EHRs in Saudi PHCCs agreed that the EHR plays a major role in improving communication among healthcare providers. A possible explanation for this result is that training improves understanding of the benefits of EHRs including improved communication among health professionals. Another study also observed that training of staff about EHRs significantly improved their use of the systems in the provision of healthcare services [15]. It had also been established that EHR training resulted in more usage of the system possibly due to increased user confidence [14]. For instance, a literature review by Wang and colleagues established that team training is one of the effective strategies that could, to some extent, improve communication between intensive care unit physicians and nurses [16]. It could, therefore, be argued that effective use of the system should go beyond the training to involve implementation where communication among healthcare providers remain key to achieve the desired patient outcomes.

Strengths and limitations of the study

A major strength of this study is that it is the first available published study in Saudi Arabia and covers a large geographical area making it generalisable to a large population in similar settings. However, the study also had some limitations. First, the findings could be biased as the study was based on participants' reports about their feeling of the impact of EHR systems in improving communication between health professionals. The target population was also not representative of health professionals working in Saudi public hospitals because the survey was done in only PHCCs. The population was also limited to healthcare professionals, but it could be extended to include other healthcare personnel such as administration staff. Furthermore, it did not include other facilities that are privately owned, managed by non-governmental organisations (NGOs) or other health service providers. It was not established whether other factors such as level of education of the participants might have an influence on their perception of the role of EHRs on improving provider-provider communication as there is evidence suggesting that these factors could influence electronic systems usage [14]. Lastly, the research mainly reports the findings from primary healthcare centres in an urban setting with well-equipped facilities that may not be generalisable to other geographical areas.

Implications for practice

The study impacts the current practice by highlighting the need for increased implementation and awareness of EHRs and their roles in healthcare among Saudi healthcare providers in PHCCs. In particular, it emphasizes the need to embrace the use of EHRs to facilitate communication among health professionals in the process of providing patient care. Considering this is the first point of care for the majority of patients, it would reduce the potential medical errors and harm to the patient thus ensuring the provision of cost-effective treatments to achieve the best outcomes. The staff should be regularly trained in the use of EHRs to improve their knowledge, skills, and confidence in using the systems so as to facilitate communication. However, the implementation of EHRs in the Saudi context should take into consideration the potential hindrance factors such as the language of communication. The working of the systems is mainly based on English, which is a second language to a large Saudi national population. This highlights the need for further training not only in using the EHR systems but also the language of communication.

Implications for research

The influence of occupation and training of health professionals on their perception of the EHRs' role on improving communication among healthcare providers should be investigated further in a larger population from urban, peri-urban, and rural areas as the geographical location may affect the results. Moreover, future studies should target all Saudi hospitals as this study targeted healthcare professionals in only PHCCs. The study also implies that other factors other than occupation and training that could influence EHR implementation in primary healthcare settings should be explored.

Implications for education

Training on EHRs should be included in teaching curriculum for all students undertaking health courses to improve their

knowledge about these systems and their role in facilitating communication for better patient care. Saudi hospital organisations should also conduct regular training of their health workers on EHRs and their benefits.

Conclusions

The study demonstrates that the occupation of Saudi healthcare providers plays a significant role in the providers' perception of the EHR role in improving communication between health professionals covering a wide range of issues related to patient care such as diagnosis, medications, and follow-up among others. However, the finding that the role of EHRs in improving communication among health professionals among other benefits varies across professions is a call for effective strategies that ensure that all healthcare providers embrace EHR systems for improved healthcare delivery. Training on EHR systems similarly influenced this providers' perception implying the tremendous benefit of training.

In this view, the study highlights the need for all PHCCs in Saudi Arabia and beyond to have EHR systems to facilitate effective communication. This is necessary to prevent errors, harms, and adverse events that may arise from ineffective communication. Moreover, all healthcare providers irrespective of occupation should be encouraged to use EHRs. This could be achieved through training that ensures that they are equipped with the necessary skills and knowledge to use them effectively.

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References

[1] Gluyas, H., 2015. Effective communication and teamwork promotes patient safety. Nursing Standard (2014+), 29(49), p.50.

[3] Gordon, J., Deland, E. and Kelly, R., 2015. Let's talk about improving communication in healthcare. Col Med Rev. 1(1), 2015, 23-27. doi: 10.7916/D8RF5T5D.

[4] Chase, D.A., Ash, J.S., Cohen, D.J., Hall, J., Olson, G.M. and Dorr, D.A., 2014. The EHR's roles in collaboration between providers: a qualitative study. In AMIA Annual Symposium Proceedings (Vol. 2014, p. 1718). American Medical Informatics Association.

[5] Wang, Y.Y., Wan, Q.Q., Lin, F., Zhou, W.J. and Shang, S.M., 2017. Interventions to improve communication between nurses and physicians in the intensive care unit: An integrative literature review. International journal of nursing sciences.

[6] Vermeir, P., Vandijck, D., Degroote, S., Peleman, R., Verhaeghe, R., Mortier, E., Hallaert, G., Van Daele, S., Buylaert, W. and Vogelaers, D., 2015. Communication in healthcare: a narrative review of the literature and practical recommendations. International journal of clinical practice, 69(11), pp.1257-1267.

[7] Robinson, G., Electronic Health Record Use: Health Care Providers' Perception at a Community Health Center.

[8] Rose, D., Richter, L.T. and Kapustin, J., 2014. Patient experiences with electronic medical records: Lessons learned. Journal of the American Association of Nurse Practitioners, 26(12), pp.674-680.

[9] Secginli, S., Erdogan, S. and Monsen, K.A., 2014. Attitudes of health professionals towards electronic health records in primary health care settings: a questionnaire survey. Informatics for Health and Social Care, 39(1), pp.15-32.

[10] Vitari, C. and Ologeanu-Taddei, R., 2018. The intention to use an electronic health record and its antecedents among three different categories of clinical staff. BMC health services research, 18(1), p.194.

[11] Hoover, R., 2016. Benefits of using an electronic health record. Nursing2018, 46(7), pp.21-22.

[12] Msiska, K.E.M., Kumitawa, A. and Kumwenda, B., 2017. Factors affecting the utilisation of electronic medical records system in Malawian central hospitals. Malawi Medical Journal, 29(3), pp.247-253.

[13] Walsh, C., Siegler, E.L., Cheston, E., O'donnell, H., Collins, S., Stein, D., Vawdrey, D.K., Stetson, P.D. and Informatics Intervention Research Collaboration (I2RC), 2013. Provider to provider electronic communication in the era of meaningful use: A review of the evidence. Journal of hospital medicine, 8(10), pp.589-597.

[14] Bredfeldt, C.E., Awad, E.B., Joseph, K. and Snyder, M.H., 2013. Training providers: beyond the basics of electronic health records. BMC health services research, 13(1), p.503.

[15] Pérez, A., Connelly, C. D., Baum, T., Bush, R. A., and Etland, C., 2018. A systematic review of the use of the electronic health record for patient identification, communication, and clinical support in palliative care. JAMIA Open, 1(2), 294-303.

[16] Ministry of Health, 2017. Annual Statistical Yearbook 2017. Available at: https://www.moh.gov.sa/en/Ministry/Statistics/book/Documents/ANNUAL-STATISTICAL-BOOK-1438H.pdf (accessed 17 January 2019.).

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