

Electronic Medical Record Systems in Saudi Arabia: Knowledge and Preferences of Healthcare Professionals

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Abstract.

Background: The use of Electronic Medical Record (EMR) systems is increasing internationally, though developing countries, such as Saudi Arabia, have tended to lag behind in the adoption and implementation of EMR systems due to several barriers. The literature shows that the main barriers to EMR in Saudi Arabia are lack of knowledge or experience using EMR systems and staff resistance to using the implemented EMR system.

Methods: A quantitative methodology was used to examine health personnel knowledge and acceptance of and preference for EMR systems in seven Saudi public hospitals in Jeddah, Makkah and Taif cities.

Results: Both English literacy and education levels were significantly correlated with computer literacy and EMR literacy. Participants whose first language was not Arabic were more likely to prefer using an EMR system compared to those whose first language was Arabic.

Conclusion: This study suggests that as computer literacy levels increase, so too do staff preferences for using EMR systems. Thus, it would be beneficial for hospitals to assess English language proficiency and computer literacy levels of staff prior to implementing an EMR system. It is recommended that hospitals need to offer training and targeted educational programs to the potential users of the EMR system. This would help to increase English language proficiency and computer literacy levels of staff as well as staff acceptance of the system.

Keywords. Electronic Medical Record; Saudi Arabia; English language; Computer literacy level; Barriers; Implementation.

1. Introduction

Electronic Medical Record (EMR) is considered an essential component of any healthcare organization.¹ Healthcare providers such as physicians and nurses spend long periods of time during their workday collecting information from patients.² Examples of the sorts of data collected are demographic information, medical history and prescribed medication use.² Some developed countries such as the United Kingdom and Canada have a national EMR system.³ On the other hand, developing countries have tended to lag behind in the adoption and implementation of Health Information Systems (HIS) such as EMR systems, or even a basic EMR system.³ The literature indicates that EMR systems implementation is limited and at times spasmodic in

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developing as well as low-income countries, largely because of the financial and implementation challenges these countries face.⁴ These challenges are likely due to technological, organizational, financial or human resources barriers.^{4,5}

In Saudi Arabia, initiatives for implementing HIS such as EMR systems have been occurring over the last three decades.^{6,7} As well as funds to assist EMR implementation, the Saudi Ministry of Health (MOH) has made clear its intention to implement HIS nation-wide.⁶ Previous research has shown that to date, HIS implementation is low within Saudi public hospitals, because Saudi Arabia is a developing country.⁸ However, it is noted that there are a number of major hospitals and healthcare organizations that have attained distinguished achievement in EMR implementation in Saudi Arabia, such as National Guard Health Affairs (NGHA) hospitals, the Armed Forces hospitals and the King Faisal Specialist Hospital and Research Centre (KFSH & RC).^{7,9} For example the NGHA hospital system was awarded the Middle East Excellence Award in electronic health records.¹⁰ It is noteworthy that these health facilities are outside the Saudi public hospital system.¹¹

Previous research in the area of EMRs in Saudi Arabia has shown that the reasons for such low uptake of EMR implementation in its hospitals is due to a number of identified barriers.^{12,13} Two of the main EMR barriers are a lack of knowledge or experience using EMR systems, and staff resistance to using the implemented EMR system.¹¹ These barriers have also been found in several other developed and developing countries, where poor if not non-existent computer literacy is one of the more common barriers to EMR adoption.¹⁴ Thus, this research aims to specifically examine health personnel's knowledge and acceptance of and preference for EMR systems in public hospitals in the western region of Saudi Arabia.

2. Objectives

This research aims to examine both the knowledge and preferences of current or potential EMR users, at seven hospitals in three cities, within the western region of Saudi Arabia. The research also aims to identify whether health personnel preference, in respect to using EMR systems, differs based on a number of aspects, including job category, English language, and computer and EMR literacy levels. Such findings may assist future implementation initiatives by informing EMR implementation plans as well as the staff recruitment policies of hospitals. In addition, the research aims to identify whether health personnel preference and acceptance, in respect to using EMR systems, differs amongst small, medium and large sized hospitals.

3. Methodology

A cross-sectional study tool was developed to collect data from seven hospitals in three cities in Saudi Arabia. The study used a researcher developed quantitative questionnaire, which was available in both online and paper-based formats. Questionnaire development was guided and structured by a key reference.¹⁵ When developing the questionnaire, the researchers took into account the literature concerning EMR implementation, barriers and facilitators as well as knowledge of

EMRs in Saudi Arabia gained by the first author through previous work and research experience. Ethical approval for the study was obtained from the Queensland University of Technology (QUT), Australia. Approval to distribute the questionnaire in Saudi Arabia was also obtained from the Director of Health Affairs, Makkah region at the Saudi Ministry of Health.

3.1 The research instrument

The questionnaire comprised three sections. The first section sought general socio-demographic information such as participant age, gender and professional background. Participants were asked to indicate their computer and English language literacy levels. The second section contained questions about EMR barriers while the third section focused on EMR implementation. Together with an information sheet and a consent form, questionnaires were distributed to the seven selected hospitals. The term Electronic Health Record (EHR) was used in the questionnaire to refer to any HIS available in the hospital.

3.2 Study population

A total of 480 questionnaires were distributed in the seven selected hospitals and 333 participants completed the survey, giving an effective response rate of 69%. All participants remained anonymous and voluntarily completed the questionnaire. Participants of this research included different healthcare personnel such as physicians, pharmacists, nurses, administration staff, laboratory staff and receptionists all of whom either use or are likely to use an EMR.

3.3 Participating hospitals

Questionnaires were distributed in seven public hospitals in Jeddah, Makkah and Taif cities, all located within the western region of Saudi Arabia. For the purpose of this research, hospital size was categorized based on bed capacity ranging from small (<250 beds), to medium (250-450 beds) and large (>450 beds). Table 1 shows the number of questionnaires distributed in each hospital together with associated response rates according to hospital size.

Table 1. Response rates, hospital location and size

Hospital Size (Bed capacity)	City	Hospital	Bed capacity	Number of Distributed Questionnaires	Number of Respondents
Small (<250 beds)	Jeddah	Hospital E	83	30	22 (6.6%)
	Makkah	Hospital H	162	30	26 (7.8%)
Medium (250-450 beds)	Jeddah	Hospital C	276	60	48 (14.4%)
	Makkah	Hospital G	261	60	36 (10.8%)
Large (>450 beds)	Jeddah	Hospital A	792	120	78 (23.4%)
	Makkah	Hospital F	493	90	52 (15.6%)
	Taif	Hospital J	454	90	71 (21.3%)
Total				480	333 (69.4%)

3.4 Study design

Questionnaires were distributed and collected between November 2011 and January 2012. Participants had the option of completing the questionnaire in either Arabic or English. Additionally, an online link was provided to all participants, should any prefer to complete an online version of the questionnaire.

3.5 Statistical analysis

The researchers primarily used SPSS software version 22, for all frequencies and descriptive analyses. The descriptive analyses were conducted by performing a number of different tests to identify relationships between variables and to make comparisons where applicable, such as Spearman's correlation, chi-square and t-tests.

4. Methodology

4.1 Characteristics of respondents

A total of seven public hospitals in the western region of Saudi Arabia were included in this study. Overall, 333 completed questionnaires were obtained, and all were in the written form of the questionnaire. The overall response rate was 69%. Details about the demographic distribution of participants are presented in Table 2. Table 2 highlights that the majority of participants (68.4%) were between the ages of 20 and 39 years. Most of the participants were graduates with either a diploma (38.1%) or bachelor degree (37.8%). Four-fifths of the participants, (80%) had Arabic as their first language.

Table 2. Participant demographics (n = 333)

Variable	n	%
Gender	Female	178
	Male	155
Age Group	20 – 29	111
	30 - 39	117
	40 - 49	75
	50 - 59	29
	60 – 69	1
Highest Education level	High School	27
	Diploma	127
	Bachelor	126
	Master	41
	Doctorate	21
Position At Work	Laboratory Staff	43
	Receptionist	18
	Pharmacist	13
	Nurse	105
	Physician	83
	Administrator	59
	Other	12

Variable		n	%
Is Arabic Your First Language?	No	64	19.2
	Yes	269	80.8
Your English Language Level	Poor	42	12.6
	Fair	88	26.4
	Good	139	41.7
	Excellent	64	19.2
Computer Literacy	Poor	45	13.5
	Fair	68	20.4
	Good	145	43.5
	Excellent	75	22.5
EMR Literacy	Poor	35	10.5
	Fair	74	22.2
	Good	99	29.7
	Excellent	26	7.8

4.2 Education, English language, computer and EMR system literacy levels

Spearman's correlation was used to examine the relationship between self-reported computer literacy, self-reported EMR literacy, self-reported English language proficiency level and education level. Results indicate that English proficiency level was highly correlated with computer literacy and EMR literacy, $r_s = 0.44$, $p < .001$ and $r_s = .31$, $p < .001$ respectively.

Education level was also highly correlated with computer literacy and EMR literacy, $r_s = .29$, $p < .001$ and $r_s = .18$, $p = .005$. It is noted that education level was not treated as a continuous variable. Thus, Spearman's correlation was used. This analysis was thought to be suitable because it retains the ordinal structure of the variable, whereas using ANOVA would lose the information in the ordinal structure.

Spearman's correlation was used to examine the relationship between computer literacy and EMR literacy. Results indicate that there was a highly significant positive relationship between computer literacy and EMR literacy, $r_s (232) = .44$, $p < .001$.

An independent sample *t*-test was used to examine if there were significant differences in computer literacy between participants who preferred to use a computer-based health record compared to those who preferred paper-based health records. Results indicate that participants who preferred computer-based health records had significantly higher self-reported computer literacy, $t (331) = 4.683$, $p < .001$.

Staff were categorized into two groups namely 'medical staff' comprising those with health professional qualifications and skills such as physicians, pharmacists, nurses and laboratory staff. The other group, 'non-medical staff', comprised receptionists and administrators. Participants who recorded their job category as 'Other' ($n=12$, 3.6%) and were not included in either group and thus were excluded from this analysis. Chi-square tests were used to examine the differences between preferred health record system and job category as well as first language (Table 3). Results indicate that there was no significant difference between job category and preferred health record system. However, those participants whose first language was not Arabic were significantly more likely to prefer using an electronic health record compared to those whose first language was Arabic ($\chi^2 (2) = 10.93$, $p < .001$).

A *t*-test was used to examine any difference in English language level between participants who either preferred an electronic health record or a paper health record. Results revealed that participants who preferred electronic health record ($M = 2.77$, SD

= 0.89) had a significantly higher English language level than participants who preferred to use a paper health record $t(331) = 4.270, p < .001$.

Table 3. Preferred health record system, job category and first language

	Electronic Health Record		Paper Health Record		χ^2
	n=	%	n=	%	
Job category					
Medical staff	206	84.4	38	15.6	2.47
Non-medical staff	59	76.6	18	23.4	
Is Arabic the first language?					
No	62	96.9	2	3.1	10.93***
Yes	214	79.6	55	20.4	

4.3 Hospital size and type of preferred health record

Of the 276 respondents who indicated their preferred type of record, approximately four-fifths (83%) would prefer to use an EMR over paper records. Respondents' preference for an EMR system rather than paper record were 90% for small hospitals and 82% respectively for medium and large hospitals.

A chi square test was used to examine any difference between hospital size and preferred type of health record, but failed to reach significance ($\chi^2(2) = 1.79, p = .426$).

5. Discussion

A small number of studies have examined the implementation of EMR systems in Saudi Arabia, and identified a range of barriers.^{7,10,12} It was noted that the main barriers obstructing EMR implementation were lack of knowledge and experience using EMR systems; and staff resistance to using the system.^{10,11} The present study adds to this body of knowledge by looking further at the lack of knowledge about and experience with using EMR systems among hospital staff in Saudi Arabia. Also, the study examined staff attitudes in respect of their preferences for EMR systems, and whether these preferences differ according to hospital size. The study yielded a number of main findings.

There was a significant positive correlation between English language proficiency level and computer literacy and EMR literacy levels. Additionally, the study results show that there is a significant correlation between education level and computer and EMR literacy levels. Thus use of and preference for EMR systems appears to be related to socio-economic determinants such as educational level, English language proficiency and computer literacy.

Moreover, other socio-demographic factors may be contributing to EMR barriers.¹⁶ For example, Arabic language was the first language of over three-quarters (80%) of all participants. However most of the EMR systems are in English language,¹⁷ and yet Arabic is the first language in Saudi Arabia. Since English language proficiency level

is significantly associated with computer literacy level and preferred health record system (electric health record rather than paper health record), it would appear important to have healthcare personnel who are literate in the English language in order to maximize the effective use of the system within Saudi public hospitals.¹⁶

By improving the overall English language proficiency and computer literacy levels of staff, it is likely that their EMR literacy level would improve. Thus, staff would be more able to use EMR systems, and the acceptance level would likely increase as well.¹⁶ By providing training or through recruiting staff with the requisite knowledge and skills one of the main barriers to EMR implementation in Saudi public hospitals could be overcome. The results highlight the importance of having well-trained staff who have the required level of computer literacy for EMR adoption for hospitals seeking to implement EMR systems in Saudi Arabia.¹⁸

Our findings have encouraging implications for hospitals wanting to increase EMR user acceptance levels in Saudi Arabia. The vast majority of participants of this study preferred the use of electronic based health records over paper based health records. However, the questionnaire findings also suggest that participants who preferred to use electronic based health records had significantly higher education and computer literacy levels. Once again, the study shows that increasing computer literacy levels amongst staff could increase the acceptance of and preference levels for using EMR systems. Thus, there is a need to provide computer training sessions for potential users and/or users who are facing difficulties using the system.¹⁹ An alternative or complementary strategy would be to recruit new staff who have the appropriate educational and computer competencies. Despite the large number of participants indicating a preference for electronic records, it is paradoxical that no participants opted to complete their survey electronically.

Overall the findings of the current study are in keeping with previous research. Previous research also found that computer literacy is a major factor for increasing user acceptance of EMRs.^{20,21} Similarly language issues such as poor English proficiency levels have been reported as one of the barriers to EMR implementation in developing countries.²² Studies have also shown that low computer literacy is one of the themes of dissatisfaction in organizations that are implementing Information Technology (IT) systems.¹⁴ Additionally, a positive correlation was found in previous research between users' positive attitude towards the system and computer literacy.¹⁴ These findings highlight the importance of considering computer literacy issues prior to implementing EMR systems, in order to increase user acceptance for adopting EMR systems in Saudi hospitals.¹⁴

The current study found no relationship between preference for type of health record system and hospital size. This finding was surprising given that a number of studies have shown that firm size usually has a positive impact on organizations when implementing new technologies.^{8,23,24} Firm size is thought to impact the implementation of new technology as large organizations potentially have more resources to invest in planning and training than medium and small healthcare organizations.¹ Studies have also indicated that hospital characteristics may differ between different sized hospitals, such as location, services provided and the number of the available clinical IT systems.^{23,25} The current study had seven participating hospitals in one province and therefore further research is needed with staff from a larger number of hospitals to investigate any possible association between hospital size and preferred health record system.

The study had a number of limitations. Firstly, the study examined seven hospitals in one region of Saudi Arabia. Thus the findings may not be representative of public hospitals in other areas of Saudi Arabia. Any attempt to generalize from the findings would need to be done with caution. Secondly, the findings of this study were based on self-report and could have been open to some response bias. The participants self-selected to complete the questionnaire, and thus it is possible that there was some selection bias. For example, it is possible that those with better computer skills or with more familiarity with EMR completed the survey.

6. Conclusion

User acceptance is one of the key factors for success in EMR implementation.²⁶ In Saudi Arabia, there is a lack of knowledge about the use of EMR systems amongst a range of health professional and administrative staff. Findings of this current study suggest that as computer literacy levels increase, so too do staff preferences for using EMR systems. While staff attitudes are favorable towards using EMR they may lack the English language and computer literacy skills that are a foundation to using EMR's. Results of this study also show that hospital size is not associated with staff preference for EMR systems over paper-based systems. These finding may assist policy makers who are seeking to develop and implement such systems in Saudi Arabia.²⁵ The vast majority of healthcare personnel in Saudi public hospitals prefer the use of an electronic based health record system, such as EMRs, regardless of the size of the hospital in which they work.

Based on these findings it is recommended that it would be beneficial for hospitals seeking to implement EMR system, to assess the English language proficiency and computer literacy levels of staff prior to the implementation. This would assist in identifying the sorts of training and educational programs that may be required, in order to have a more literate staff who could then maximize their use of the system. Recruitment strategies, in Saudi public hospitals, could also use the information to ensure that new staff come with the appropriate foundation or enabling skills and knowledge. Further study using a larger sample size and hospitals from more regions could examine if there is an association between both English language and computer literacy levels and hospital size in Saudi public hospitals.

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8. Disclosure

The author reports no conflicts of interest in this work.

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