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# The Factors Related to the Use of Electronic Medical Records Among Healthcare Professionals in Hospitals Management

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## Abstract

*Background: Electronic Medical Records (EMRs) are digitalized medical record systems that collect, store, and display patient data. It is individual patient clinical information electronically gathered and made instantly available to all physicians in the healthcare chain, assisting in the delivery of coherent and consistent care. The study aims: To examine the factors associated with the use of Electronic Medical Records (EMR) in hospitals management. Methods: A cross-sectional design was conducted. Three hundred and ninety-six (396) healthcare professionals (HCPs) were surveyed from the various public hospitals in Makkah, KSA. The participants included physicians, physician assistants, nurses, laboratory technicians, radiologists, pharmacists, record managers, and ICT staff. Frequency and Chi-Square analyses were performed on the data. Results: The results showed that approximately 59% (n=212) of HCPs indicated low use of EMR services in their hospitals. Lack of computer competence (p<0.001), poor communication between users (p=0.050), cost of EMR resources and facilities (p<0.001), lack of technical personnel to install and operate EMR technology resources (p<0.001), and lack of EMR software packages (p<0.001) had significant negative relationships with EMR utilization. Conclusion: Utilization of EMR services is low among the HCPs. Therefore, the Health Service needs to provide training to their employees and supply the needed resources to encourage and support the hospitals and healthcare workers to increase the utilization of the EMR services that improve healthcare delivery. To enhance EMR utilization, it will be essential that government supports health facilities that have challenges*

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*using EMR. To better understand the issues, a mixed method approach is recommended to be used to study healthcare workers from both private and public healthcare facilities.*

***Keywords:*** *healthcare professionals (HCPs), Electronic Medical Records (EMRs).*

## Introduction

Healthcare organizations are showing high pressure to serve their customers using electronic platforms, this might be due to the massive growing nature of health information communication (an experience of sharing health-related information using digital technologies and databases for treating illness), usage by the healthcare providers and patients/ clients (1, 2). Healthcare organizations are usually indicated by data-intensive units as they generate and amass enormous amounts of data and information from their day-to-day activities (3, 4). Electronic Medical Records (EMRs) are defined as automated medical record systems that collect, store, and display patient/ client data. Those automated medical records allow health professionals to create readable and well-organized records as well as improve access to clinical information about specific patients' or clients' outcomes (5-7).

Furthermore, EMRs are designed to replace the recent manual (typically paper-based) MRs that practitioners are already familiar with and used for documenting patients' medical information (8). EMR technologies play a great role for HCPs by providing valuable information in different formats with printed graphs such as; weight cholesterol levels, and blood pressure, and it also tracks changes over time (9). In Kingdom of Saudi Arabia (KSA), the situation is progressing faster than many countries due to many reasons including undergoing changes in the healthcare system, good financial resources, and the associated healthcare technology diffusion (10, 11) where the place of KSA is leading in this field as compared with other Middle East countries. One of the features of Saudi healthcare system is that the public healthcare sector is essentially financed by oil revenues allocated budget, ranging from 5.9% of the government's total budget in 2006 to 7.82% in 2022. This is one of the reasons behind the apparent success of the KSA healthcare system (12).

Technological advancement is increasing exponentially, affecting every facet of human existence, with public health and healthcare delivery a great beneficiary. Thus, health information becomes one critical factor helping to strengthen and improve healthcare delivery in every country (13). Traditionally, patients' health information is saved and managed on papers and files. However, due to the advancement in Information Communication Technology (ICT), there has been a seismic shift from the traditional paper and file system to the adoption of the computer and other electronic devices to managing patients' health information known as e-health (14). This move has improved the general reliability and effectiveness of health information and further strengthened healthcare delivery systems through its various tailor-made innovative applications and programs such as EMR (15).

Tang and McDonald, (2011) (16) considered EMR generically to mean a repository of electronically maintained information about an individual's health status and healthcare. Meanwhile, McMullen et al., (2014) (17) explained that EMR is a single practice digital version of a patient's chart. Thus, EMR contains patients' medical history, diagnoses, charts and treatments which are designed to be shared with other healthcare providers like physicians and pharmacists, either within the same health facility or across other health

facilities for the management of patients' health and wellbeing. The advent of the EMR has therefore speedily facilitated healthcare services to patients, reduced waiting time, and addressed structural problems within the health service systems (18). However, owing to uncertainty about what exactly constitutes a computer-based MRs, many scholars (16, 19), firms (20) and institutions (17) have several definitions for EMR.

Some studies have been conducted on the benefits of EMR in the Western Region (21, 22) and the adoption and use of EMR in the Ashanti Region (23). Findings from the Western Region indicated that the hospital had sufficient preparations such as an establishment of Information Technology (IT) department, provision of infrastructure and network connections, and the training of staff. However, these authors highlighted some inadequacies, including inadequate computers, inadequate training and the non-involvement of users in the design and configuration of the system, with poor network connections, illegible handwriting of some doctors, unstable power supply and increased work task as other challenges (21). Similarly, a pilot study from Ashanti Region revealed insufficient funding, inadequate computers and accessories, lack of full time IT experts, automatic data and power backups, data entry and limited office space (22).

However, the authors from Western and Ashanti Regions predominantly studied institutional factors rather than personal factors. The studies were also qualitative, and hospital-based rather than regional-based, which limit their scopes and the ability to generalize their results and findings. The adoption and utilization of EMR services for healthcare delivery was supposed to be implemented across the country after the few pilots, which indicated its viability and usefulness to service outputs and patients' satisfaction and health outcomes (21, 24). However, available literature shows that no study has been conducted on the factors influencing utilization of EMR in KSA. Moreover, the Eastern Region has one regional and many district hospitals, where the adoption and use of the ICT services including EMR will yield higher quality service delivery and utilization, and better patients' health outcomes (22, 25).

In addition, the adoption and utilization of modern technological services like EMR would have yielded to better provisions of healthcare services to the vast majority of their clients. Also, all categories of HCPs are collectively important to the successful healthcare delivery chain. For that matter, the adoption and utilization of EMR by this array of professionals becomes topical in contemporary healthcare delivery. Therefore, the aim of the current study is to investigate the factors associated with the utilization of EMR in public hospitals in Makkah, KSA. Based on this purpose, the study was backed by three objectives that sought to assess the level of utilization of EMR in public hospitals, examine the relationship between personal factors and EMR utilization by HCPs, and determine the relationship between institutional factors and EMR utilization by HCPs.

## Methods

A cross-sectional design was conducted. In this study employed stratified and simple random sampling procedures to obtain study sample, the population proportion (assumed to be 0.50) and the degree of accuracy expressed as proportion (0.05). Ten percent was added to cater for non-responses, making the sample size 396 study participants. Three hundred and ninety-six (396) healthcare professionals (HCPs) were surveyed from the five various public hospitals in Makkah, KSA. The participants included physicians, physician assistants, nurses, laboratory technicians, radiologists, pharmacists, record managers, and ICT staff.

A questionnaire was administered by the researchers after permission was granted by the hospital authorities from January to July 2022. Hospital administrators and unit heads were contacted and dates and times were arranged for the data collection. To avoid contextual influence, an introductory session was arranged to brief participants on the purpose of the study and the standard instructions needed for a completion of the questionnaire. Participants provided written informed consent, by signing the form, after the participants were assured of anonymity and confidentiality at all stages of the data collection process. The copies of questionnaire were delivered to the participants by hand and they were given three days to complete and return them for collection by the researchers. Three hundred and ninety-six (396) copies were administered and 91% return rate was achieved. This represented 360 questionnaires and that formed the sample size used for the analysis.

Instrumentation

We developed a questionnaire based on literature, and further segmented the questionnaire into four sections, which measured demographic characteristics, utilization of EMR, personal factors and institutional factors that influence EMR respectively. First section solicited demographic characteristics (i.e., gender, level of formal education, age, position in the facility and number of years at the facility). Second section: comprised 15 items, which obtained data on the utilization of EMR at the health facility, inquired on the extent to which electronic system was used to do the following (e.g., record vital signs, record diagnosis, record and maintain medication allergy lists).

Third section: subscale measured personal factors influencing the utilization of EMR. Some of the items in this section were “lack of general computer competence”, “poor communication between users” and “the fear of using technology”. Fourth section items were on institutional factors influencing EMR utilization and few of such factors were “Lack of adequate infrastructure,” “Maintenance costs of EMR technology facilities” and “Lack of software packages of EMR.” Participants responded to the items in third and fourth sections a four-point scale ranging between strongly disagree (4) and strongly agree (1).

To ensure reliability of the instrument, the questionnaire was pre-tested using by HCPs not included in study sample. The internal consistency measure for the binary variable subscales of the instrument was calculated using Kuder–Richardson Formula 20 (KR-20) and Cronbach’s Alpha was used to assess the reliability of the continuous (four-point Likert scale) items. The questionnaire yielded reliability coefficients of 0.78 and 0.81 for the binary and continuous variables respectively. Moreover, the initial questionnaire was given to five expert in Health Education, and three health information manager for their evaluation and inputs, which we incorporated into the final instrument for data collection. In addition, ethical approval was obtained from the University.

Data were analyzed in different stages using SPSS version 28. Regarding EMR utilization, responses were categorized into ‘high’ for respondents who chose ‘yes’ for at least 8 items out of the 15 items and ‘low’ for respondents who chose ‘yes’ for 7 items or less out of the 15 items. These scores were transformed into frequency and percentages. On the relationship between personal factors and EMR utilization as well as institutional factors and EMR utilization, significant differences were assessed with a univariate analysis using Chi-square test with continuity correction at an alpha level of 0.05.

## Results

In the present study examined factors associated with the use of EMR in public hospitals. The results are presented by looking at first, the level of utilization of EMR among the healthcare workers; second, relationship between personal factors of the workers and EMR utilization, and third, relationship between institutional factors and EMR utilization among the healthcare workers.

Characteristics of the research participants

The participants included 26.6% (n=95) nurses/midwives, 19.7% (n=71) physician assistants, 14.8% (n=53) pharmacists/dispensing technicians, 9.9% (n=35) physicians, 9.3% (n=33) laboratory technicians, 8.6% (n=31) record managers, 6.8% (n=24) radiologists, and 5.2% (n=18) ICT staff. With the age range of 21-59, and working experience between one and 38 years, 62.8% (n=226) of the participants were married, 29.2% (n=105) single, 5.3% (n=19) divorced, while 2.7% (n=10) were identified as either widows or widowers. Majority of the participants, 46.8% (n=168), completed the bachelor's degree, 22.7% (n=82) diploma, 20.5% (n=74) certificate, 9.4% (34) master degree, and only 0.6 (n=2) were doctorate degree holders.

Utilization of EMR by health professionals in the public hospitals

Frequency count and percentage analysis were used to find out the level of EMR utilization among health professionals. The findings revealed low utilization of EMR among the health professionals, as results in Table (1) show that about 59% (n=212) of health professionals indicated low use of EMR services in their hospitals.

Relationship between personal factors and EMR utilization

Table (2) contains Chi-Square analysis on the relationship between personal factors and EMR utilization among healthcare professionals. The results showed that lack of computer competence ($\chi$ 2=45.643, p<0.001), lack of knowledge about EMR ($\chi$ 2=70.765, p<0.001), lack of use of EMR technology ($\chi$ 2=255.993, p<0.001), workload ($\chi$ 2=26.747, p<0.001), and poor communication between users ($\chi$ 2=3.855, p=0.050) had statistically significant negative relationships with EMR utilization, and that as these factors exist, the rate of EMR utilization among these healthcare workers will continue to be low.

Relationship between institutional factors and EMR utilization

Table (3) covers results on the relationship between institutional factors and EMR utilization among the healthcare professionals. The results showed that lack of general infrastructure ($\chi$ 2=151.167, p<0.001), cost of EMR resources and facilities ($\chi$ 2=33.906, p<0.001), lack of technical personnel to install and operate EMR technology resources ($\chi$ 2=65.806, p<0.001), maintenance cost of EMR technology facilities ($\chi$ 2=52.093, p<0.001), inadequate internet bandwidth ($\chi$ 2=85.528, p<0.001), legal concepts (security and privacy) ($\chi$ 2=97.014, p<0.001) and lack of EMR software packages ($\chi$ 2=171.218, p<0.001) had statistically significant negative relationship with EMR utilization among the healthcare professionals.

Table (1): Utilization of EMR by health professionals in the public hospitals

| Level of utilization | Frequency | Percentage |
|---|---|---|
| High | 148 | 41.1 |
| Low | 212 | 58.9 |

Table (2): Relationship between personal factors and EMR Utilization

| Personal Factors | Level of Utilization | | $\chi$ 2 | P-value |
|---|---|---|---|---|
| | High | Low | | |
| Lack of general computer competence | | | | |
| Disagree | 51.3% (138) | 48.7% (131) | 45.64 | <0.001 |
| Agree | 11.0% (10) | 89.0% (81) | | |
| Lack of knowledge of EMR | | | | |
| Disagree | 57% (134) | 43% (101) | 70.765 | <0.001 |
| Agree | 11.2% (14) | 88.8% (111) | | |
| Lack of use of EMR technology | | | | |
| Disagree | 87.5% (140) | 12.5% (20) | 255.993 | <0.001 |
| Agree | 4% (8) | 96% (192) | | |
| Fear of using technology | | | | |
| Disagree | 42.8% (133) | 57.2% (178) | 2.582 | .108 |
| Agree | 30.6% (15) | 69.4% (34) | | |
| Too much workload | | | | |
| Disagree | 51.3% (117) | 48.7% (111) | 26.747 | <0.001 |
| Agree | 23.5% (31) | 76.5% (101) | | |
| Poor communication between users | | | | |
| Disagree | 45.5% (96) | 54.5% (115) | 3.855 | .050 |
| Agree | 35.1% (52) | 64.9% (96) | | |

Table (3): Relationship between institutional factors and EMR utilization

| Institutional Factors | Level of Utilization | | $\chi$ 2 | P-value |
|---|---|---|---|---|
| | High | Low | | |
| Lack of general infrastructure | | | 151.167 | <0.001 |
| Disagree | 89.8% (97) | 10.2% (11) | | |
| Agree | 20.2% (51) | 79.8% (201) | | |
| Cost of EMR resources and facilities | | | 33.906 | <0.001 |
| Disagree | 69.1% (56) | 30.9% (25) | | |
| Agree | 33% (92) | 67% (187) | | |
| Lack of technical personnel to install and operate EMR technology resources | | | 65.806 | <0.001 |
| Disagree | 58% (127) | 42% (92) | | |
| Agree | 149% (21) | 85.1% (120) | | |
| Maintenance cost of EMR technology | | | 52.093 | <0.001 |
| Disagree | 78.9% (56) | 21.1% (15) | | |
| Agree | 31.8% (92) | 68.2% (197) | | |
| Inadequate internet bandwidth | | | 85.528 | <0.001 |
| Disagree | 73.2% (93) | 26.8% (34) | | |
| Agree | 23.8% (55) | 76.2% (176) | | |
| Legal concepts (security and privacy) | | | 97.014 | <0.001 |
| Disagree | 71.7% (107) | 28.7% (43) | | |
| Agree | 19.5% (41) | 80% (169) | | |
| Lack of EMR software packages | | | 171.218 | <0.001 |
| Disagree | 76% (133) | 24% (42) | | |
| Agree | 8.1% (15) | 91.9% (170) | | |

## Discussion

The main focus of this study was to examine the factors associated with the utilization of EMR in the public hospitals. These findings showed that utilization of EMR services was particularly low compared with the United Kingdom (96%) and the Netherlands (99%) (26, 27). The reason for the low level of EMR utilization in this study and many developing nations is linked to implementation costs, administrative and technical problems, privacy problems and problems regarding empathy and inflexibility (28, 29). The findings of the current study confirm the findings of other studies (30, 31) who also found low level of utilization of EMRs. Contrary to the current study, two studies (32, 33) found high EMR utilization among health professionals.

The dissimilarities in the findings can be ascribed to the different sampling, setting and population characteristics. By inference, quality healthcare service delivery in the health facilities may be poor as waiting time, ineffective data on patients, and other purposes that EMR seeks to cater for will not be in place. The non-use of EMR to record diagnosis automatically tracks prescription of medications with an electronic medication administration record (eMAR) which may compromise effective healthcare delivery to patients (27). We also found personal factors (i.e., lack of general computer competence, lack of knowledge about EMR, lack of use of EMR technology, the fear of using technology, too much workload and poor communication between users) to be significantly associated with EMR utilization by the health professionals.

This finding reaffirms the results from other developing nations (34, 36) and Saudi Arabia (29) where personal factors are associated with EMR uptake. The reason may be that most of these factors were likely to be predominant individual capacity factors which are also sometimes associated with the use of new technologies. The decision of an individual to move from one way of doing something to another is sometimes problematic, probably because of lack of general competence, knowledge about that technology, inadequacy in the technology usage, the fear of using technology, too much workload and communication between users (22, 24).

This is further mentioned to by other studies that found personal factors as barriers to the use of technology in healthcare delivery (34, 36). For instance, evidence suggests that, among hospitals without electronic records systems, the most commonly cited personal barriers were resistance on the part of physicians, unclear return on investment, and lack of availability of staff with adequate expertise in information technology (37). By inference, we contend that other methodological disparities accounted for the difference in the study findings.

The present study further found that institutional factors including lack of general IT infrastructure, cost of EMR resources and facilities, and maintenance, lack of technical personnel, lack of reliable EMR software and inadequate internet bandwidth, and security challenges with privacy of patients' data were significantly associated with EMR utilization. The current study confirms the findings obtained by Sood et al., (2008) (38) and Odekunle et al., (2017) (39) on institutional factors and EMR utilization. Respondents' own institutional memory and experience show that most of the health facilities have inadequate infrastructure that support the use of EMR.

## Conclusion

Despite the positive effects of using EMR, there are still personal and institutional barriers hampering the smooth implementation of its services to improve healthcare delivery. Healthcare managers' should make efforts to address the barriers of EMR utilization from multidisciplinary health professionals and government. Widespread utilization of EMRs may essentially impact and improve the quality of healthcare delivery, while yielding significant income. However, the cost of EMR may also hinder its utilization. To enhance EMR utilization, it will be essential that government supports health facilities that have challenges using EMR due to financial challenges, while limiting political influence in their activities.

A range of policy options can be used to facilitate the development and improvement of EMRs services. Healthcare administrators need to begin preparing their staff for the inevitable technology upgrades that will take place in their practices. The training of health professionals across all divides needs to include health technology. In addition, the systemic challenges need to be addressed to pave ways for the healthcare system to take advantage of the current technological revolution. To better understand the issues, a mixed method approach is recommended to be used to study healthcare workers from both private and public healthcare facilities.

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