

# Human Factors of EHR Adoption in Saudi Primary Healthcare

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**Abstract.** Electronic Health Records are rapidly gaining traction in healthcare with increased acceptance and adoption. However, there is limited understanding of factors influencing adoption in primary care. This paper investigates the human factors of EHR adoption in primary healthcare in Saudi Arabia. An online survey questionnaire was sent to all primary healthcare professionals in Riyadh city, Saudi Arabia. A 65.9% (1127/1710) response rate was obtained. The respondents demonstrated positive perceptions of EHRs in relation to the systems' benefits. The perceptions were influenced by sociodemographic variables; hence, need consideration when implementing EHRs in primary care.

**Keywords.** EHRs, healthcare professionals, perceptions, primary care

## 1. Introduction

A growing body of literature suggests that Electronic Health Records (EHRs) are increasingly adopted at different levels of care, including primary healthcare due to their potential benefits, such as improved work efficiency, better quality of health care, and reduced medical costs [1-3]. However, despite the efforts to deploy EHRs in healthcare, implementation challenges still abound. World Health Organization (WHO) note that the adoption rates are still much lower, especially in the low- and middle-income countries, due to several factors [4]. Health care providers' perceptions, attitudes, intentions, and behaviors have been found to influence the adoption and use of EHRs [5, 6]. These tendencies are also affected by a range of factors related to individual, organizational, and system characteristics [5-10].

In Saudi Arabia, the ongoing healthcare system reforms have led to the introduction of EHRs at the primary care level, with all primary care centers (PCCs) currently transitioning from paper-based records to electronic systems [8]. Few studies on this area show that health care providers' perceptions are critical determinants of EHR adoption in Saudi hospitals [8, 11, 12]. Individual and system attributes have also been identified to influence healthcare professionals' perceptions in hospitals in the GCC region [13].

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However, little is known about the influencing factors at the primary care level. This paper examines the potential role of sociodemographic factors on perceptions and adoption of EHRs in primary care in Saudi Arabia.

2. Methods

All (1710) healthcare professionals working in PCCs in Riyadh city, Saudi Arabia, and are directly interacting with EHRs to provide care were invited to participate in a large survey evaluating perceptions about the adoption of EHRs [14]. They comprised of physicians, nurses, pharmacists, technicians, and allied health professionals. The survey questionnaire was adapted from a previous study in Turkey [15]. It had three components related to perceived benefits of EHR adoption (14 items), obstacles to EHR adoption (9 items), and satisfaction with EHRs (10 items) in primary care. The tool was deployed online using Research Electronic Data Capture (REDCap) between November 30, 2017 and January 30, 2018. University of Tasmania Social Science Human Research Ethics Committee and the Ministry of Health of Saudi Arabia approved the study.

3. Results

3.1. Sociodemographic characteristics of the participants

The completed surveys were 1127, a 65.9% response rate. Most of the respondents were nurses, females, Saudis, aged 20 – 34 years, had less than 10 years of work experience in primary care, and lacked previous health experience outside the Kingdom of Saudi Arabia (KSA), previous EHR training, and experience with EHR. These sociodemographic characteristics of the respondents are presented in Table 1.

Table 1. Sociodemographic characteristics of the participants

Demographic characteristics of participants		Respondents (N=1127)
Occupation	Physician	209 (18.5%)
	Nurse	367 (32.6%)
	Pharmacist	208 (18.5%)
	Technician	228 (20.2%)
	Other	115 (10.2%)
Gender	Male	503 (44.6%)
	Female	624 (55.4%)
Nationality	Saudi	811 (72.0%)
	Non-Saudi	316 (28.0%)
Age (years)	20–34	608 (53.9%)
	35–49	471 (41.8%)
	50+	48 (4.3%)
Length of work experience in primary healthcare (years)	0–10	870 (77.2%)
	11–20	226 (20.1%)
	21+	31 (2.8%)
Previous health experience outside KSA	No	686 (60.9%)
	Yes	441 (39.1%)
Previous training in EHRs in primary healthcare	No	674 (59.8%)
	Yes	453 (40.2%)
Previous EHR experience in primary healthcare	No	686 (60.9%)
	Yes	441 (39.1%)

### 3.2. Perceptions of benefits, obstacles and satisfaction with EHRs

The respondents indicated a high agreement with all the statements related to the benefits and satisfaction with EHR. In contrast, all the perceived obstacles had a low agreement level, except for the statement that an EHR system ‘needs frequent revisions due to technological developments that had an agreement level of 45.3% (Table 2).

**Table 2.** Agreement levels with perceived benefits, obstacles and satisfaction items

Dimension	Item	Level of agreement (%)
Benefits of adopting EHR in primary care	Provides quick and reliable access to scientific research	76.0
	Enables easy access to information from past medical records	73.9
	Provides access to patient data and analysis	76.8
	Provides better data	74.5
	Makes it easy to transfer data	74.4
	Provides access to practice standards	73.6
	Enables following test results	75.3
	Saves time in documenting health data	75.2
	Decreases paper-based documentation	77.1
	Improves the feeling of professionalism	76.2
	Improves communication between health professionals and patients	73.7
	Contributes to health professionals’ ability to make patient care decisions	72.3
	Improves communication between health professionals	73.5
	Reduces medical errors	63.5
Obstacles to adopting EHRs in primary care	Is too complicated and not user-friendly	17.0
	Compromises patient safety	18.8
	Decreases interaction between the health professional and patient	20.5
	Increases health professionals’ workloads	23.5
	It is difficult to provide data security in EHRs	19.6
	Consumes more time than paper-based systems	25.2
	Is ‘down’ frequently	20.9
	Is costly	24.8
	Needs frequent revisions related to technological developments	45.3
Satisfaction with EHR in primary care	I feel EHR is useful	78.9
	I feel EHR is an important system for primary health care centers	77.0
	I feel EHR has been successful in primary health care centers	67.7
	I feel EHR is worth the time and effort required to use it	70.1
	I feel the EHR improves the quality of healthcare services in primary healthcare centers	74.8
	I feel the quality of my work has improved	68.2
	I feel the quality of information has improved due to EHR	70.9
	I feel my performance has improved due to EHR	65.9
	I feel patient safety has improved due to EHR	65.8
	Overall, I am satisfied with the EHR system in primary healthcare centers	69.1

### 3.3. Relationships between sociodemographic characteristics and perceptions of benefits, obstacles and satisfaction with EHRs

The healthcare professionals’ perceptions varied with sociodemographic characteristics. There were significant differences across all perceived benefits in relation to occupation, age, experience outside KSA, and EHR training ( $p < 0.05$ ). For example, physicians, older respondents ( $\geq 50$  years), and those without experience outside the KSA indicated the

highest agreement with all the benefits. Gender, nationality, and work experience also demonstrated significant differences across most benefits. In contrast, there were no significant differences across all benefits except for 'improves communication between health professionals' based on previous EHR experience.

There were significant differences across all items for obstacles by occupation and age. Nationality and experience outside KSA were associated with significant relationships in perceptions of most obstacles. However, non-Saudis indicated a lower agreement with all the obstacle items. There were also no significant differences across all the obstacle items with respect to previous EHR experience.

Lastly, there were significant differences across all satisfaction items in relation to occupation, nationality, age, length of work experience, experience outside KSA, and EHR training. For example, physicians and respondents with no experience outside the KSA and EHR training had a higher agreement with all the items than their counterparts. Non-Saudis and respondents aged 50 years and above, and with >20 years of experience had a higher agreement level with most items compared to professionals who are Saudis, younger and have fewer years of experience. In addition, most satisfaction items showed significant differences across gender but not in terms of previous EHR experience.

#### **4. Discussion**

This study reported a high agreement with statements for benefits and satisfaction with EHRs but a low one with obstacles. There were significant differences in respondents' perceptions of EHR benefits based on occupation, age, previous experience working outside KSA, and previous training in EHRs ( $p < 0.05$ ). The perceptions were significantly associated with only occupation and age for the obstacles to EHR adoption. However, satisfaction with EHRs was significantly associated with all the demographic variables except previous experience using EHR in primary care.

Similar to the results of previous studies [7, 15, 16], the findings suggest that the respondents generally had a positive perception of EHRs and were more likely to accept and use the systems in primary care. However, the associations with sociodemographic variables indicate that personal attributes also affect EHR adoption. The significant differences across the sociodemographic factors except for previous experience in EHR suggest that the perception and adoption of EHRs are likely to vary among health care providers. For example, physicians tend to have a more positive perception and are more likely to adopt EHRs compared to other health care providers, as demonstrated by the highest agreement level with benefit and satisfaction items. Other studies have also supported these findings [16, 17]. Of great concern is the finding that Saudi healthcare professionals appear to have a less positive perception of EHRs compared to non-Saudis. Although the finding could be attributed to prior exposure and more knowledge about EHR systems among non-Saudi healthcare professionals, it signifies challenges that the policymakers may face with implementation of the Saudisation policy that aims to increase the Saudi workforce in all sectors, including healthcare. Training of Saudi care providers in EHRs could be crucial in improving adoption in this setting as training has been shown to improve knowledge and skills about the EHR system as well as increasing health care providers' confidence, satisfaction and positive perception [7, 18].

Overall, this study found a positive perception and satisfaction with the EHRs among healthcare professionals in PCCs in Saudi Arabia. It, however, highlighted the impact that sociodemographic variables could have on the adoption of these electronic systems

intended to revolutionize the delivery and provision of health care services. The study also shows that these factors should be taken into account when implementing EHRs in healthcare settings. Thus, this study makes a unique contribution to knowledge about the role of human factors in the adoption of EHRs in Saudi primary care and similar settings. Future research should investigate a full spectrum of factors that may influence healthcare professionals' perceptions in order to inform the system's adoption and implementation.

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