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Use of Electronic Health Information to Advance Health Research

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Abstract. EHRs provide several benefits with the potential of improving healthcare quality. There is also a growing interest in using EHR for research purposes to improve clinical care and administrative processes. This paper examines the potential role of EHRs in supporting clinical research in primary care. Healthcare professionals (1710) working in primary care centers in Riyadh city, Saudi Arabia, were surveyed. The response rate was 65.9%. The majority of the respondents (76.0%) perceived EHR to provide quick and reliable access to scientific research. To improve EHR utilization in health research, the challenges related to its use should be addressed.

Keywords. electronic health records, clinical research, primary care

1. Introduction

Electronic health records (EHRs) are increasingly adopted to improve the quality and efficiency of health services. The systems offer numerous healthcare benefits, such as better communication, improved documentation of clinical data, and reduced medical errors [1-3]. In addition, EHRs have been used for secondary purposes, including health research. EHRs contain vast and detailed clinical information; thus, they can act as a primary data source for population health and clinical research [4, 5]. Specifically, EHRs can support clinical trials' design and execution, including feasibility, recruitment, data collection, and adverse events reporting [4-7]. The role in observational and comparative effectiveness studies has also been documented [5].

Furthermore, large data sets extracted from EHR have been useful in populating disease registries for research and administrative reporting and clinical audits for healthcare quality improvement, epidemiology surveillance, and public health [3]. These EHR research functions are supported by new technological tools derived from data engineering, computer science, informatics, and statistics that help mine, synthesize, analyze, link, and share information [4, 8]. Therefore, EHRs can be used as standalone repositories or sources of pooled data sets for conducting specific research

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or large population-based studies. This study examines the potential role of EHRs in promoting health research from the perspective of healthcare providers in primary care.

2. Methods

All healthcare professionals working in primary care centers (PCCs) in Riyadh city, Saudi Arabia were invited to participate in a survey evaluating perceptions about the adoption of EHRs [9]. A 33-item questionnaire with three components: EHR benefits (14 items), obstacles to EHR adoption (9 items), and satisfaction with EHRs (10 items) that had been previously used in Turkey [10] was adopted and validated for this study. The items were rated on a five-point Likert scale of 1-Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree, and 5-Strongly Agree. The questionnaire was deployed online between 11/30/2017 and 01/30/2018. For better results presentation, the responses were summarized under three categories, namely 'Disagree' combining strongly disagree and disagree responses, 'Neutral' for only neutral responses, and 'Agree' combining strongly agree and agree responses. Ethics approval was obtained from the University of Tasmania Social Science Human Research Ethics Committee and the Ministry of Health of Saudi Arabia. Prior consent was also obtained from all the participants.

3. Results

3.1. Demographic characteristics

In total, 1127 (65.9%) participants completed the survey. They were predominantly nurses (32.6%). The majority were Saudis (72.0%) and had less than ten years of work experience (77.2%). Nearly 60% of the respondents lacked previous experience outside Saudi Arabia, EHR experience, and EHR training (Table 1).

Table 1. Demographic 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. Perception of the healthcare professionals towards EHR benefit in research

The majority of the respondents (76.0%, 856) agreed with the benefit statement that an EHR 'provides quick and reliable access to scientific research' (Table 2). In contrast, 6.8% (77) disagreed while 17.2% (194) provided neutral responses.

3.3. Correlation between demographic characteristics and perception of the benefit

All demographic factors except for previous experience in EHRs were significantly correlated with the perception of the EHR role. Physicians, females, and healthcare professionals aged 50 or more years and those with 11-20 years of work experience had the highest agreement levels with the benefit item. Similarly, non-Saudis, healthcare professionals without work experience outside KSA, and those with previous training in EHR had higher agreement levels with the benefit item compared to their counterparts. Concerning previous EHR experience, healthcare professionals with and without this experience had almost equal agreement levels with this benefit (76.0% vs. 75.9%, p = 0.240).

Table 2. Correlation between demographic characteristics and perception of the benefit

Demographic characteristics	Agreement levels with the benefit			p-value
	Disagree (N = 77)	Neutral (N = 194)	Agree (N = 856)	
Occupation, n (%)				
Physicians	3 (1.4)	19 (9.1)	187 (89.5)	<0.001
Nurses	48 (13.1)	29 (7.9)	290 (79.0)	
Pharmacists	11 (5.3)	32 (15.4)	165 (79.3)	
Technicians	12 (5.3)	71 (31.3)	145 (63.6)	
Allied professionals	3 (2.6)	43 (37.4)	69 (60.0)	
Gender, n (%)				
Male	23 (4.6)	106 (21.1)	374 (74.4)	0.001
Female	54 (8.7)	88 (14.1)	482 (77.2)	
Nationality, n (%)				
Saudi	75 (9.2)	147 (18.1)	589 (72.6)	<0.001
Non-Saudi	2 (0.6)	47 (14.9)	267 (84.5)	
Age, n (%)				
20–34	30 (4.9)	95 (15.6)	483 (79.4)	0.002
35–49	46 (9.8)	93 (19.7)	332 (70.5)	
50+	1 (2.1)	6 (12.5)	41 (85.4)	
Length of work experience, n (%)				
0–10	68 (7.8)	178 (20.5)	624 (71.7)	<0.001
11–20	8 (3.5)	13 (5.8)	205 (90.7)	
21+	1 (3.2)	3 (9.7)	27 (87.1)	
Experience outside KSA, n (%)				
No	53 (7.7)	81 (11.8)	552 (80.5)	<0.001
Yes	24 (5.4)	113 (25.6)	304 (68.9)	
EHR training, n (%)				
No	55 (8.2)	142 (21.1)	477 (70.8)	<0.001
Yes	22 (4.9)	52 (11.5)	379 (83.7)	
EHR experience, n (%)				
No	53 (7.7)	112 (16.3)	521 (75.9)	0.240
Yes	24 (5.4)	82 (18.6)	335 (76.0)	

4. Discussion

Most primary care providers in Riyadh perceive EHRs to be beneficial in healthcare research, which is consistent with previous studies [1, 4, 7, 10]. The EHR systems can support clinical research by providing quick and reliable access to patient health data, such as lab tests, radiology, and pathology results. These data can be analyzed and interpreted to inform patient care and healthcare interventions [2, 5]. These findings suggest that the application of EHRs goes beyond the traditional storage functions to serving as a crucial tool for research. Therefore, EHRs can help overcome research challenges related to recruitment, data collection, uncertainty in the generalizability of results, and high research costs [4, 5]. These benefits ensure the conduct of quality research that can improve the overall quality of healthcare.

Although these findings suggest that EHR presents new research opportunities, several factors might affect this application. First, this study showed that sociodemographic characteristics could influence users' perception and use of EHR in research. Second, EHR records contain a lot of free texts that might make it difficult to obtain the required data. Moreover, wrong entries, incomplete records, and the use of synonyms as well as abbreviations might affect the quality of EHR data [6]. In addition, data security, privacy, confidentiality, and legal and ethical concerns regarding consent and sharing of patient EHR data can be major limitations to the system's utilization in clinical research [5, 7, 11]. These factors must be adequately addressed to optimize EHR use in health research. Effective collaboration between various parties, such as researchers, healthcare providers, and vendors, is necessary.

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