

## **The Role of Electronic Health Records s in Improving the Management of Chronic Diseases in Saudi Arabia**

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## ABSTRACT

Chronic diseases represent a significant health challenge worldwide, accounting for a substantial portion of mortality in Saudi Arabia. The effective management of these diseases requires comprehensive, longitudinal data on patient health, which can be facilitated by Electronic Health Records (EHRs). EHRs are central to improving healthcare systems by providing accessible, high-quality health data that support evidence-based decision-making and enhance the management of chronic conditions such as diabetes, hypertension, obesity, and cardiovascular diseases. This study investigates the role of EHRs in enhancing the management of chronic diseases in Saudi Arabia, specifically focusing on the Ministry of Health's (MOH) implementation of EHR systems. The research examines the effectiveness of EHRs in providing rich data on disease frequency distribution, categorizing chronic diseases by sociodemographic factors, and identifying at-risk patients. The study also evaluates barriers to EHR adoption, such as lack of computer literacy and insufficient experience among healthcare providers. Using a cross-sectional design and secondary data from EHRs, the research found statistically significant improvements in the management of chronic diseases in King Fahd Medical City with increased EHR usage. The study concludes that EHR systems play a vital role in chronic disease management by improving patient care, supporting health professionals, and facilitating public health monitoring. Recommendations include enhancing technological infrastructure and providing further training to healthcare workers, to align with the goals of Saudi Arabia's Vision 2030 in improving health services. Future studies are suggested to focus on increasing the effectiveness and utilization of EHR systems in the country's healthcare institutions.

## المخلص

تمثل الأمراض المزمنة تحديًا صحيًا كبيرًا في جميع أنحاء العالم، حيث تمثل نسبة كبيرة من الوفيات في المملكة العربية السعودية. تتطلب الإدارة الفعالة لهذه الأمراض بيانات شاملة وطويلة عن صحة المريض، والتي يمكن تسهيلها من خلال السجلات الصحية الإلكترونية. تعد السجلات الصحية الإلكترونية عنصرًا أساسيًا لتحسين أنظمة الرعاية الصحية من خلال توفير بيانات صحية عالية الجودة وسهلة الوصول إليها تدعم اتخاذ القرارات القائمة على الأدلة وتعزز إدارة الحالات المزمنة مثل مرض السكري وارتفاع ضغط الدم والسمنة وأمراض القلب والأوعية الدموية. تبحث هذه الدراسة في دور السجلات الصحية الإلكترونية في تعزيز إدارة الأمراض المزمنة في المملكة العربية السعودية، مع التركيز بشكل خاص على تنفيذ وزارة الصحة لأنظمة السجلات الصحية الإلكترونية. يبحث البحث في فعالية السجلات الصحية الإلكترونية في توفير بيانات غنية عن توزيع تواتر المرض، وتصنيف الأمراض المزمنة حسب العوامل الاجتماعية والديموغرافية، وتحديد المرضى المعرضين للخطر. كما تقيم الدراسة الحواجز التي تحول دون تبني السجلات الصحية الإلكترونية، مثل الافتقار إلى معرفة الكمبيوتر وعدم كفاية الخبرة بين مقدمي الرعاية الصحية. باستخدام تصميم مقطعي وبيانات ثانوية من السجلات الصحية الإلكترونية، وجد البحث تحسينات ذات دلالة إحصائية في إدارة الأمراض المزمنة في مدينة الملك فهد الطبية مع زيادة استخدام السجلات الصحية الإلكترونية. وخلصت الدراسة إلى أن أنظمة السجلات الصحية الإلكترونية تلعب دورًا حيويًا في إدارة الأمراض المزمنة من خلال تحسين رعاية المرضى ودعم المتخصصين في الرعاية الصحية وتسهيل مراقبة الصحة العامة. وتشمل التوصيات تعزيز البنية التحتية التكنولوجية وتوفير المزيد من التدريب للعاملين في مجال الرعاية الصحية، بما يتماشى مع أهداف رؤية المملكة العربية السعودية 2030 في تحسين الخدمات الصحية. ومن المقترح أن تركز الدراسات المستقبلية على زيادة فعالية واستخدام أنظمة السجلات الصحية الإلكترونية في مؤسسات الرعاية الصحية في البلاد.

## INTRODUCTION

Chronic diseases are considered a big health problem all over the world. Chronic diseases account for 73% of all fatalities in Saudi Arabia (Altuwaijri, 2008). Chronic diseases necessitate the documentation of longitudinal data from an increasing population. Consequently, sustaining adequate high-quality data is essential for achieving effective care.

A functional and integrated electronic health record system is fundamental to a robust healthcare system and essential for formulating successful, evidence-based health policy decisions. EHRs are the heart of health information systems and play a vital role by sharing information about health, which delivers a fuller picture of health and illness across populations. This knowledge can yield comprehensive statistics regarding the frequency distribution of various chronic diseases and the sociodemographic elements influencing them. (AlSadrah, 2020)

EHRs can play a crucial role in improving chronic diseases in many aspects. Effectively designed EHRs can enhance patient care for individuals with chronic conditions across all components of the chronic care paradigm. It can aid healthcare providers in making decisions concerning patient care. It facilitates the digital management of health directives for chronic patients, encompassing prescription medications, laboratory examinations, radiological assessments, and physical therapy (Kucher et al., 2005). Moreover, EHRs enhance the compliance of healthcare practitioners with protocol-based recommended care and evidence-based clinical standards. Ultimately, it facilitates the sharing of electronic health information among various institutions (NAHIT, 2011).

Standardized and accessible EHR systems enhance our comprehension of chronic diseases by supplying extensive data for observational studies, identifying possible study participants, and facilitating national monitoring systems (DesRoches, et al. 2008).

Nevertheless, considerable mismatch remains between the demand for EHRs and a country's ability to respond. This disconnection prompts numerous inquiries regarding the necessity and beneficiaries of key information, as well as the methods for generating and using this information locally to address pertinent local needs and demands.

The present study is crucial in elucidating the function of EHRs in the representation of health data for patients with chronic diseases, encompassing the frequency distribution of these conditions, as well as morbidity and mortality indices. Furthermore, the findings of the present study may elucidate the function of EHRs in identifying individuals at risk for chronic diseases by accessing data pertaining to background and underlying risk factors. Therefore, emphasize the significance of Electronic Health Records (EHRs) in the early identification and management of chronic diseases in Saudi Arabia, such as diabetes, hypertension, obesity, and cardiovascular diseases.

## RESEARCH PROBLEM

Despite the fact that chronic diseases are one of the primary challenges facing the health system in Saudi Arabia and that EHRs have the potential to improve these diseases, the implementation of this system is impeded by numerous obstacles, such as the lack of knowledge and experience among health care providers and the need for computer literacy. The efficiency of the system in providing rich data regarding the frequency distribution of various categories of chronic diseases and background and sociodemographic variables that affect these diseases could be impeded by these barriers to EHR implementation. Consequently, the objective of this study is to examine the extent to which the Saudi Ministry of Health (MOH)'s electronic health records (EHRs) have enhanced the management of chronic diseases in Saudi Arabia.

## RESEARCH QUESTIONS

1. What is the role of EHRs in providing rich data regarding the frequency distribution of different types of chronic diseases in Saudi Arabia?
2. What is the role of EHRs in differentiating different chronic diseases relative to demographic and social data?
3. Is EHRs effective in screening subjects at risk for chronic diseases?

## RESEARCH HYPOTHESES:

1. There is statistically significant impact of the Electronic Health Records on Management of Chronic Diseases in King Fahd Medical City
2. There are statistically significant differences in the response level of the study sample about the role of electronic health records in improving the management of chronic diseases due to the personal characteristics of the study sample.

## RESEARCH OBJECTIVES

1. To determine the role of EHRs of Saudi MOH in providing rich data regarding the frequency distribution of different types of chronic diseases.
2. To determine the role of EHR system of Saudi MOH in categorizing these chronic diseases according to different background and sociodemographic variables.
3. To determine the role of EHR system of Saudi MOH in identifying patients at risk for chronic diseases e.g. those with positive family history for chronic diseases.

## **THEORETICAL FRAMEWORK AND PREVIOUS STUDIES:**

### **A. PREVIOUS STUDIES:**

The present study examined the function of EHRs in the enhancement of chronic diseases in Saudi Arabia. According to Jabali & Jarrar (2018), the implementation of electronic health records (EHRs) is currently underway in seven institutions in Saudi Arabia. He investigated the advantages of employing the data generated by electronic health records (EHRs) to diagnose and analyze a variety of medical causes and phenomena associated with chronic diseases. Furthermore, these data are employed to develop features such as notifications that enhance documentation and counseling, as well as to predict mortality rates among patients with chronic diseases.

In the same vein, Alshammari (2021) asserted that electronic health records (EHRs) empower chronic patients by allowing them to share information with healthcare providers and to manage the health issues that affect them. Furthermore, he asserted that EHRs could enhance the accessibility and efficiency of healthcare services for these patients by utilizing technologies like telemedicine.

Additionally, Kucher et al. (2005) discovered that the utilization of electronic health records (EHRs) could help clinicians increase the use of prophylactic care for chronic patients (Niès, et al. 2010). Rossi & Every (1997) discovered that EHRs were associated with an 11.3% increase in appropriate hypertension treatment in a primary care setting (Tierney, et al. 1990). In a similar vein, Rossi & Every (1997) discovered that this was the case.

Al Otaybi et al. (2022) observed that healthcare workers in Saudi Arabia were more accepting of EHRs when they were senior, non-Saudi, and had participated in EHR training. In addition, they were more satisfied with EHRs. They also noted that the primary benefit of EHRs was an enhanced quality of care, which was followed by an increase in productivity. Additionally, a study conducted in Saudi Arabia in 2021 revealed that 98.07% of male respondents and 88.88% of female respondents expressed their support for the national adoption of EHRs, with no significant disparity between the two groups (Alshammari, 2021).

Another concern is the correlation between the efficacy of health care delivery and the use of electronic health records (EHRs). Efficiency is the prevention of resource waste, which encompasses energy, ideas, equipment, and supplies (Wilson, et al. 1982). Redundant diagnostic testing is a significant form of waste (Chen, et al. 2003). Nies et al. (2010) discovered that EHRs decreased the number of unnecessary tests, particularly for chronic patients (Devine, et al. 2010). In the same vein, Tierney et al. (1990) observed a 14.3% reduction in the number of diagnostic tests ordered per visit and a 12.9% reduction in the cost of diagnostic tests per visit when employing EHRs (Menachemi, et al. 2008). Other research has reported an 18% and 27% decrease in the number of tests ordered for medical visits in the emergency department (Amarasingham, et al. 2009) and in redundant laboratory tests of antiepileptic medication in hospitals (Agrawal, 2002).

Bates et al. (1998) documented a 55% reduction in significant medical errors as a result of the use of EHRs in relation to patient safety (Bates, et al. 1999). Bates et al. (1999) similarly asserted that EHRs can decrease medication errors by 86% (Jabali & Jarrar, 2018). Devine et al. (2010) documented a reduction in medication errors of 18.2% to 8.2% in the outpatient setting through the use of electronic health records (EHRs) (Schmitt & Wofford, 2002).

Menachemi et al. (2008) discovered that hospitals that implement HER technologies have higher desirable rates on a variety of commonly used quality indicators (Miller, et al. 2005). In the same vein, Amarasingham et al. (2009) discovered that these hospitals had a lower mortality rate and fewer complications, which resulted in lower costs associated with chronic diseases (Wang, et al. 2003). Conversely, numerous investigations have investigated potential drawbacks associated with the implementation of EHRs. The costs have been documented in both inpatient and outpatient settings in a number of these studies. An average initial cost of US\$50,000–US\$70,000 per physician for a three-physician office was estimated in the ambulatory setting (Fleming, et al. 2011). In contrast, Schmitt et al. reported that the total cost of a seven-year-long EHRs installation project for a 280-bed acute care hospital was approximately US\$19 million (Alkrajji, et al. 2013). Furthermore, Miller et al. (2005) discovered that the average annual maintenance cost for the HER in small-group primary care practices was US\$8412 per full-time equivalent (FTE) provider (Hasanain & Cooper, 2014). A study indicated that the temporary decline in productivity among healthcare professionals and workflow disturbance due to the initial installation of electronic health records (EHRs) resulted in a cost of US\$11,200 per provider in the first year. The study projected a productivity decline of 20%, 10%, and 5% in the first, second, and third months, respectively, with productivity later reverting to its former levels (Kimura et al., 2011). Nonetheless, advancements in technology have significantly reduced the initial costs associated with the deployment of EHRs. Miller et al, 2005 projected an initial expenses of US\$22,038 for software, training, and installation and hardware costs of US\$13,000 per full-time-equivalent provider in a small-group primary care practice (Heisler, 2006). Fleming et al. (2011) documented expenses of US\$162,047 (equivalent to US\$32,409 per physician) during the initial 60 days for a five-physician practice to use an EHR system (BAOS et al. 2005). In Saudi Arabia, a small number of studies studied the deployment of EHRs especially in public institutions (AbouZahr, et al. 2007; Kucher, et al. 2005). Khan et al., (2021) indicated that the rate of implementation is rather slow, and certain problems inhibit the adoption include lack of knowledge, lack of qualified labor, and ineffective planning (Niès, et al. 2010). A substantial positive association was reported between English language proficiency level and computer literacy and EHRs literacy levels (AbouZahr, et al. 2007). Arabic language was the first language of approximately three-quarters (80%) of all Saudi participants. Nonetheless, the majority of EHR systems are in the English language (AISadrah, 2020). Similarly, Al Sadrah (2020) asserted that recognizing and mitigating these obstacles

is crucial for the effective implementation of EHR systems across all healthcare facilities (AlSadrah, 2020). Similarly, Jabali et al. (2018) indicated that the majority of public hospitals in Saudi Arabia must increasingly implement electronic health records (EHRs) and its features (Suhrccke et al., 2006).

## **B. THEORETICAL FRAMEWORK**

### **1. Definition of electronic health record system**

According to Al Otaybi et al. (2022), EHRs are a type of longitudinal electronic record that compiles a patient's health information from various care delivery settings into a single database. Electronic health records, or EHRs, are large databases that include information on patients' medical histories and the treatments they've received. Thanks to IT developments, electronic health records (EHRs) are now indispensable for healthcare data administration (Alshahrani, et al. 2019).

Electronic health records (EHRs) offer great promise for modernizing healthcare by moving away from a paper-based system and toward a digital one that can make better use of existing data to provide better treatment (Menachemi & Collum, 2011).

To enable investors to make decisions that support and improve the delivery of efficient health care services, regardless of the model employed to deliver these services, EHRs primarily document, retrieve, communicate, and process data (Katehakis & Tsiknakis, 2006).

Effective electronic health records (EHRs) can include demographic and clinical data such patient complaints, prescriptions, vital signs, lab findings, surgical and medical histories, immunization records, and radiology reports in addition to socio-demographic data (Ronquillo, 2012). A part of the American Recovery and Reinvestment Act (ARRA) (sometimes called the "stimulus package"), the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 was passed to aid healthcare providers in utilizing HERs in health care delivery (NAHIT, 2011).

### **2. Benefits of electronic health record system**

Clinical, organizational, and societal outcomes are among the advantages of electronic health records (EHRs). The quality and safety of care are enhanced by the function of EHRs in clinical outcomes. The organizational outcome includes an increase in consumer satisfaction, operational efficiency, and financial performance. Improved population health is a societal outcome (Menachemi & Collum, 2011).

Quality of care has been defined as the act of performing the appropriate action to the appropriate person at the appropriate time and achieving the greatest possible results in the context of quality and safety (Azubuike & Ehiri, 1999). Wolfe (2001) defines patient safety as the prevention of patient injuries during the provision of health care.

There are numerous factors that could result in health care providers failing to adhere to the best practice guidelines, which are designed to guarantee the highest quality and safety of care. These factors may encompass an insufficient understanding of these guidelines or their appropriateness for a specific patient. Another contributing factor is the insufficient time to execute the guidelines during the patient visit. EHRs that are connected to CDS tools address these challenges and enhance the compliance of healthcare providers with evidence-based clinical guidelines and protocol-based recommended care (Freudenheim, 1996).

### **3. Advantages of electronic health record system in improving chronic diseases**

The increasing costs of healthcare are significantly influenced by chronic diseases. The objective of chronic care is not solely to rehabilitate patients, but rather to assist them in maintaining a high quality of life (Wagner, 1998). In order to prevent exacerbations and complications of their illnesses, patients and families with chronic illnesses necessitate planned, consistent interactions with their attendants. This interaction encompasses behaviorally sophisticated support for the patient's function as self-manager, as well as systematic attention to treatment guidelines (BAOS, et al. 2005). The lives of patients are significantly impacted by chronic diseases, necessitating the collection of longitudinal data on an increasing number of individuals. Consequently, it is essential to maintain a high level of data integrity in order to provide high-quality care. EHRs can be advantageous to patients with chronic diseases by facilitating the continuous recording and analysis of patient data to modify the prescribed regimen, diet, and medication consumption (Levinson, et al. 2007). In addition, electronic health records (EHRs) can provide patients with chronic diseases with the necessary information to engage in decision-making related to their diagnosis and prescribed treatment (Holman & Lorig, 2000). Therefore, electronic health records (EHRs) enhance communication between physicians and patients and can be considered a precursor to the emerging paradigm, in which chronic patients assume the role of primary caregivers and healthcare professionals serve as supportive consultants, rather than passive recipients of care (Vermeire, et al. 2001). In this view, patients' non-compliance and associated issues are diminished as a result of the fact that they are no longer required to adhere to the doctor's orders, but rather to engage in shared decision-making (Schmitt & Wofford, 2002).

### **4. Potential disadvantages of electronic health record system**

While electronic health records (EHRs) have many advantages, this technology also has some possible drawbacks. Some of the problems that have arisen as a result of the introduction of electronic health records (EHRs) include changes to workflow, temporary drops in productivity, worries about privacy and security, and a plethora of unexpected outcomes. There are a number of monetary considerations that go into the adoption and implementation of EHRs. These include the purchase and installation of software and hardware, the digitization of paper charts, and user training (Menachemi, 2006). Expenses related to software upgrades, hardware replacements, and continuing education for EHR users also need to be considered (Fleming, et al. 2011).

Adaptation to the new system might cause health care practitioners to temporarily disrupt their workflow and lose productivity,



which is another downside of EHRs. However, when the system improves, productivity returns to its initial levels. It was estimated that consumers of EHRs spent 134.2 hours of their nonclinical responsibilities on EHR installation activities (Zurita & Nohr, 2004).

Another drawback of EHRs is the increased danger of patient privacy violation caused by the widespread communication of health information (Westin, 2005). However, there are a plethora of laws in place to protect the confidentiality of patient information. These safeguards make it far more difficult for unauthorized parties to access sensitive data stored electronically, even yet very little data is completely secure (Parver, 2009).

Anxieties, power shifts, and technological dependency are some of the possible unforeseen effects of electronic health records (Campbell, et al. 2006). As medical professionals grow increasingly dependent on technology, the risk of their being overly reliant on it rises. For instance, if HHRs prevent the purchase of certain pharmaceuticals, healthcare providers may lose their independence to make decisions about their patients (Blumenthal & Tavenner, 2010).

### **5. Why we need electronic health record system**

Electronic health records (EHRs) have a lot of room to grow in terms of features that can boost system quality while cutting costs. Nevertheless, the three primary features are clinical decision support (CDS), health information exchange (HIE), and computerized physician order entry (CPOE) (IOM, 2001).

When it comes to patient care, a CDS is the system that helps doctors and nurses make decisions. It enables doctors to reduce medical mistakes while providing treatment that is both safer and more efficient. The most up-to-date information regarding a medicine, medication allergies, drug interactions, and other computer-identified patient concerns is part of the CDS system (Bates, et al. 1998).

CPOE is the technology that enables the electronic health order process, doing away with paper altogether. The following services may be required per these orders: medication, laboratory testing, imaging, and physiotherapy. This streamlines the ordering process and gets rid of the risk of medical mistakes caused by doctors' sloppy handwriting. Also, there's no need for the pharmacy and nursing staffs to ask for clarification on any missing information. Serious drug errors might be cut in half, according to Bates et al. (1998), if just the CPOE system were used. Further research by Jabali & Jarrar (2018) shown that when the system is integrated with CDS, the percentage rises to 83%. The efficiency and efficacy of health care can be enhanced through the implementation of a CPOE system coupled to a CDS system.

Inter-organizational exchange of electronic health records is known as health information exchange (HIE) (Azubuike & Ehiri, 1999). Health information used to be sent by mail or fax, which made it difficult for doctors in different places to get their hands on it quickly when they needed it. The health information exchange (HIE) system allows for the storage of patient records at many sites and organizations providing treatment (Khalifa, 2013). Medical facilities such as primary care clinics, specialty clinics, pharmacies, hospitals, and emergency rooms may fall within this category. The safe and, maybe, real-time transfer of patient data might benefit from this. Consequently, fewer unnecessary and expensive laboratory tests will be done due to a lack of access to patient records kept by another practitioner. Health information exchange (HIE) has the potential to improve healthcare quality while decreasing costs (WHO, 2020).

### **6. Electronic health record system and chronic diseases in Saudi Arabia**

The Kingdom of Saudi Arabia has established a 2030 vision that aims to reduce crude dependence, enhance the public sector, and diversify the economy. The Saudi Ministry of Health (MOH) is committed to enhancing the quality, accessibility, equability, and standards of healthcare in the country, in alignment with the Kingdom's vision (Al Kuwaiti, et al. 2018). Healthcare systems worldwide are confronted with numerous challenges, including chronic diseases. Chronic diseases account for 73% of all fatalities in Saudi Arabia. Cardiovascular diseases are the primary cause of chronic disease-related mortality, accounting for 37% of all fatalities. Cancer follows at 10%, followed by diabetes at 3%, respiratory diseases at 3%, and other chronic diseases at 20% (Alshammari, 2021). The Saudi Ministry of Health has implemented national initiatives to address the chronic disease epidemic in the country. One of these initiatives that has the potential to improve healthcare and manage chronic diseases is the implementation of EHRs in the public sector (Aldosari, 2014). Healthcare services are provided by the government through various governmental agencies in Saudi Arabia, which operates under the national healthcare system. Saudi Arabia is ranked 26th in the world for the provision of high-quality healthcare services to its citizens (Zaman, et al. 2018). DesRoches, et al. (2008) estimate that the healthcare sector will account for 15.6% of the total budget allocations in 2019, which is the third greatest budget share. Nevertheless, the implementation of the HER system in Saudi public hospitals is minimal, as the country is still in the process of development (Freudenheim, 1996). The primary obstacles to the low implementation of EHR systems are staff resistance and a lack of knowledge or experience with EHRs (Hasanain, et al. 2014). Administrative personnel, physicians, and patients comprise users of electronic health record (EHR) systems. Nevertheless, the primary consumers of EHRs are the medical staff, which includes physicians and nurses, who utilize them to access patients' health information (Luna, et al. 2014).

Nevertheless, the Saudi government has implemented incentives to address the low level of EHR implementation. One of these incentives is the financing of these technologies for healthcare facilities that are unable to afford them. The government also offers educational programs to train HER users (Stansfield, et al. 2006). In addition, numerous well-known hospitals and healthcare organizations in Saudi Arabia have successfully implemented electronic health records (EHRs). These include the Armed Forces hospitals, the National Guard Health Affairs (NGHA) hospitals, and the King Faisal Specialist Hospital and Research Centre (KFSH & RC) (AbouZahr, et al. 2007).

## 7. Challenges for electronic health record implementation

HER systems, particularly in developing countries, encounter numerous obstacles, despite the global interest and investment in health outcomes. Developing countries have historically been slow to adopt and implement EHRs (Rossi & Every, 1997). Due to historical, social, and economic factors, there is a scarcity of robust and effective electronic health records (EHRs) in developing countries to monitor the health status of their populations. The majority of HER systems in these countries are unresponsive to the requirements of users, complex, and fragmented. (Rossi & Every, 1997). Numerous electronic health record (EHR) systems in these nations are technologically inefficient, such as the absence of centralized databases, standardized processes, and quality assurance procedures. The statistical data of mortality, morbidity, and human resources are frequently disregarded, as staff members are inadequately compensated and undervalued (Khan & Lutfi, 2021).

### RESEARCH METHODOLOGY

The researchers were able to infer the intended results from the survey data that they obtained thanks to the analytical approach that used in the current investigation.

#### 1. Research design and setting

A cross-section study was conducted. The study utilized secondary data from EHRs in Saudi Arabia.



#### 2. Sampling and population

The formula  $n = \{Z^2 PQ\}/D^2$  was employed to determine the sample size. The minimum required sample size is  $n$ , the standard normal variable is  $Z$ , which is 1.96 at a 95% confidence interval, the hypothesized proportion of chronic diseases in Saudi Arabia is 20%,  $Q$  is equal to  $1-P$ , and the acceptable margin of error is  $d$ , which is 0.05 at a 95% confidence interval. Therefore, the minimal required sample size is 245 subjects and be increased to 300 subjects to increase the power of the study. Inclusion criteria are subjects who visited the Primary Health Care (PHC) centers of Saudi Ministry of Health (MOH) during the study period and registered in the EHR system, aged > 18 years, Saudi/ non-Saudi, and both gender.

The electronic health record (EHR) data sheet of eligible participants was acquired from the Saudi Ministry of Health, and a systematic random sampling method was employed to get the necessary sample size.

#### 3. Ethical consideration

A written permission to utilize these data was obtained from EHR system, Saudi MOH after explanation of the nature of the study. Ethical approval from Institutional Review Board (IRB) was not required as the study utilized secondary data. The collected data are anonymous and will not be used for another purpose than the study.

#### 4. Statistical analysis

The frequency distribution of the background variables of the studied subjects was conducted. The included subjects were categorized according to their age groups, gender, educational level, occupation, and family history of diseases. The frequency distribution of chronic diseases was related to different background variables.

##### 1. Study tool

The questionnaire, its axes, and phrases will be developed by the research using an electronic questionnaire form as a field study instrument. This will be accomplished by referencing the theoretical foundation of the study and relevant prior research. The researchers employed a five-point Likert scale to assess the responses submitted by the participants.

##### 2. Data Analysis

The questionnaire data will be analyzed using SPSS23, which will include the Alpha coefficient, frequencies, percentages, mean, standard deviation, relative weight, Pearson correlation coefficient, regression coefficient, T-test, and ANOVA.

##### 3. Study population and sample:

Out of a total study population of Workers in King Fahd Medical City, there were **440** respondents who responded to the survey.

#### 4. Validate the study tool

*Table (1) Correlation phrase Electronic Health Records*

| Phrases   | Correlation coefficient | P-value |
|---|-------------------------|---------|
| Electronic health records reduce the workload of physicians   | 0.788**                 | 0.000   |
| Electronic health records contribute to better patient outcomes.  | 0.851**                 | 0.000   |
| Electronic health records connect the patient and the health service provider   | 0.774**                 | 0.000   |
| Electronic health records help patients schedule their appointments   | 0.707**                 | 0.000   |
| Electronic health records provide patients with an additional and quick way to book an appointment with service providers and health care providers | 0.762**                 | 0.000   |
| Electronic health records reduce the burden of administrative work  | 0.775**                 | 0.000   |
| Electronic health records reduce waiting times for patients in clinics and health centers   | 0.788**                 | 0.000   |
| Electronic health records make it easy to transfer information to patients  | 0.885**                 | 0.000   |
| Electronic health records contribute to greater patient satisfaction  | 0.846**                 | 0.000   |
| Electronic health records increase a patient's understanding of their health status   | 0.859**                 | 0.000   |
| Electronic health records help providers better manage preventable diseases   | 0.800**                 | 0.000   |
| Electronic health records provide providers with tools to identify patients' risks and health behaviors   | 0.820**                 | 0.000   |
| Electronic health records help patients educate themselves and better manage potential health risks   | 0.809**                 | 0.000   |
| Electronic health records contribute positively to preventive care  | 0.797**                 | 0.000   |
| EHR-based care allows clinicians to focus more on patients  | 0.750**                 | 0.000   |
| Electronic health records help providers make decisions that consider all aspects of a patient's health.  | 0.829**                 | 0.000   |
| Electronic health records help doctors know all information about a patient   | 0.799**                 | 0.000   |
| Electronic health records allow multiple providers to access the same important information   | 0.861**                 | 0.000   |
| Electronic health records contribute to higher efficiency rates   | 0.675**                 | 0.000   |
| EHRs are cost effective   | 0.828**                 | 0.000   |

The structural validity of the instrument was demonstrated by a correlation coefficient of 0.01 for the Electronic Health Records items.

*Table (2) Correlation phrase Management of Chronic Diseases*

| Phrases   | Correlation coefficient | P-value |
|---|-------------------------|---------|
| The preventive measures implemented help detect early signs of chronic diseases   | 0.808**                 | 0.000   |
| The hospital is concerned with achieving the quality of care provided to patients with chronic diseases                                   | 0.886**                 | 0.000   |
| The hospital is interested in achieving the best possible treatment outcomes for patients with chronic diseases                           | 0.833**                 | 0.000   |
| The hospital is interested in the availability of all data about patients to help analyze and support decision-making.                    | 0.859**                 | 0.000   |
| The hospital works to implement all procedures to avoid lawsuits  | 0.768**                 | 0.000   |
| The hospital works to organize a healthy life for patients with chronic diseases  | 0.782**                 | 0.000   |
| The hospital is interested in working to reduce the deterioration of the health of patients with chronic diseases                         | 0.879**                 | 0.000   |
| The hospital is interested in determining treatment plans and prescribed doses for patients with chronic diseases                         | 0.858**                 | 0.000   |
| The hospital implements procedures that contribute to maintaining the efficiency of the body's systems for patients with chronic diseases | 0.874**                 | 0.000   |
| The preventive measures implemented help detect early signs of chronic diseases   | 0.565**                 | 0.000   |

The structural validity of the instrument was demonstrated by a correlation coefficient of 0.01 for the Management of Chronic Diseases questions.



## 5. Reliability study tool

*Table (3) Reliability questionnaire*

| dimension                      | Alpha Cronbach | number of elements |
|--------------------------------|----------------|--------------------|
| Electronic Health Records      | 0.969          | 20                 |
| Management of Chronic Diseases | 0.941          | 10                 |
| <b>Total questionnaire</b>     | 0.978          | 30                 |

All of the research tools have a high reliability, as measured by a high Cronbach's alpha value.

## 6. Ethics

The research adhered to the ethics and principles of scientific research. It mentioned previous studies and research related to the study, which were used as references for the study. the research also clarified the reasons for using the questionnaire form for the members of the study sample. they were assured that all data and information will be used for the purposes of scientific research only and that it is confidential and will not be seen by anyone. this contributed to encouraging the study sample to answer the questionnaire

## ANALYSIS AND RESULTS

This section will examine the study's applied framework by examining the questionnaire, determining the features of the study sample, evaluating the study's axis, and testing the hypotheses to fulfill the study's objectives.

### 1. Personal data

*Table (4) sample according to Personal data*

|                               | Categories                          | N   | %    |
|-------------------------------|-------------------------------------|-----|------|
| Gender                        | Male                                | 196 | 44.5 |
|                               | female                              | 244 | 55.5 |
| Age                           | Less than 30 years old              | 153 | 34.8 |
|                               | From 30 to less than 40 years old   | 151 | 34.3 |
|                               | From 40 to less than 50 years old   | 82  | 18.6 |
|                               | 50years old and over                | 54  | 12.3 |
| Academic qualification        | High school                         | 66  | 15.0 |
|                               | Bachelor                            | 227 | 51.6 |
|                               | Master                              | 62  | 14.1 |
|                               | PhD                                 | 85  | 19.3 |
| Job                           | medical                             | 83  | 18.9 |
|                               | nursing                             | 90  | 20.5 |
|                               | Technical                           | 69  | 15.7 |
|                               | Administrative                      | 198 | 45.0 |
| Number of years of experience | Less than 5 years                   | 140 | 31.8 |
|                               | From 5 years to less than 10 years  | 58  | 13.2 |
|                               | From 10 years to less than 15 years | 106 | 24.1 |
|                               | 15 years and over                   | 136 | 30.9 |

## 2. The variables of study

### A. The Electronic Health Records axes:

*Table (5) Phrases of the Electronic Health Records*

| N. | Phrase  | Mean  | S. D  | Degree | Arrangement |
|----|---|-------|-------|--------|-------------|
| 1  | Electronic health records reduce the workload of physicians   | 3.823 | 1.028 | High   | 9           |
| 2  | Electronic health records contribute to better patient outcomes.  | 3.923 | 1.067 | High   | 6           |
| 3  | Electronic health records connect the patient and the health service provider   | 4.032 | 0.942 | High   | 4           |
| 4  | Electronic health records help patients schedule their appointments   | 3.764 | 1.014 | High   | 14          |
| 5  | Electronic health records provide patients with an additional and quick way to book an appointment with service providers and health care providers | 4.064 | 0.790 | High   | 3           |
| 6  | Electronic health records reduce the burden of administrative work  | 3.650 | 1.219 | High   | 18          |
| 7  | Electronic health records reduce waiting times for patients in clinics and health canter  | 4.077 | 0.842 | High   | 2           |
| 8  | Electronic health records make it easy to transfer information to patients  | 3.659 | 1.206 | High   | 17          |
| 9  | Electronic health records contribute to greater patient satisfaction  | 3.886 | 1.033 | High   | 7           |
| 10 | Electronic health records increase a patient's understanding of their health status   | 3.945 | 0.972 | High   | 5           |
| 11 | Electronic health records help providers better manage preventable diseases   | 3.714 | 1.282 | High   | 15          |
| 12 | Electronic health records provide providers with tools to identify patients' risks and health behaviors   | 3.709 | 1.053 | High   | 16          |
| 13 | Electronic health records help patients educate themselves and better manage potential health risks   | 3.600 | 1.143 | High   | 19          |
| 14 | Electronic health records contribute positively to preventive care  | 3.823 | 1.130 | High   | 11          |
| 15 | EHR-based care allows clinicians to focus more on patients  | 3.441 | 1.252 | High   | 20          |
| 16 | Electronic health records help providers make decisions that consider all aspects of a patient's health.  | 3.823 | 1.097 | High   | 10          |
| 17 | Electronic health records help doctors know all information about a patient   | 3.777 | 1.072 | High   | 13          |
| 18 | Electronic health records allow multiple providers to access the same important information   | 3.873 | 0.979 | High   | 8           |
| 19 | Electronic health records contribute to higher efficiency rates   | 4.136 | 0.769 | High   | 1           |
| 20 | EHRs are cost effective   | 3.805 | 1.038 | High   | 12          |

The mean of the Electronic Health Records for all expressions was 3.826, with a standard deviation of 1.046, indicating a high level of performance.

**B. The Management of Chronic Diseases axes:**

*Table (6) Phrases of the Management of Chronic Diseases*

| N. | Phrase  | Mean  | S. D  | Degree | Arrangement |
|----|---|-------|-------|--------|-------------|
| 1  | The preventive measures implemented help detect early signs of chronic diseases   | 3.991 | 0.864 | High   | 5           |
| 2  | The hospital is concerned with achieving the quality of care provided to patients with chronic diseases                                   | 3.968 | 0.877 | High   | 7           |
| 3  | The hospital is interested in achieving the best possible treatment outcomes for patients with chronic diseases                           | 4.095 | 0.856 | High   | 2           |
| 4  | The hospital is interested in the availability of all data about patients to help analyze and support decision-making.                    | 4.005 | 0.867 | High   | 4           |
| 5  | The hospital works to implement all procedures to avoid lawsuits  | 3.950 | 0.833 | High   | 8           |
| 6  | The hospital works to organize a healthy life for patients with chronic diseases  | 4.082 | 0.811 | High   | 3           |
| 7  | The hospital is interested in working to reduce the deterioration of the health of patients with chronic diseases                         | 3.982 | 0.815 | High   | 6           |
| 8  | The hospital is interested in determining treatment plans and prescribed doses for patients with chronic diseases                         | 3.882 | 0.952 | High   | 10          |
| 9  | The hospital implements procedures that contribute to maintaining the efficiency of the body's systems for patients with chronic diseases | 3.932 | 0.906 | High   | 9           |
| 10 | The preventive measures implemented help detect early signs of chronic diseases   | 4.123 | 0.934 | High   | 1           |

The Management of Chronic Diseases was characterized by a high level of expression, with a mean of 4.001 and a standard deviation of 0.872.

**a. Test Research Hypotheses**

**First: There is statistically significant impact of the Electronic Health Records on Management of Chronic Diseases in King Fahd Medical City**

*Table (7) impact of the Electronic Health Records on Management of Chronic Diseases*

| B     | T        | F          | R     | P-VALUE |
|-------|----------|------------|-------|---------|
| 0.377 | **42.323 | **1791.256 | 0.896 | 0.000   |

The hypothesis is supported by the statistically significant impact of the Electronic Health Records on the Management of Chronic Diseases in King Fahd Medical City, as evidenced by the positive correlation at 0.01 in Table 7. The Management of Chronic Diseases in King Fahd Medical City increased by 0.377% as the Electronic Health Records level increased by 1%.

**Second: There are statistically significant differences in the response level of the study sample about the role of electronic health records in improving the management of chronic diseases due to the personal characteristics of the study sample.**

**Table (8) differences in the response level of the study sample about the role of electronic health records in improving the management of chronic diseases due to gender**

| personal characteristics | Categories | N   | mean    | T-test   | P-VALUE |
|--------------------------|------------|-----|---------|----------|---------|
| Gender                   | Male       | 196 | 102.888 | 12.899** | 0.000   |
|                          | female     | 244 | 127.492 |          |         |

It is evident that the gender variable at the level of 0.01 has a statistically significant impact on the response level of the study sample regarding the role of electronic health records in improving the management of chronic diseases. The differences were in favor of females, suggesting that they are the most cognizant and empathetic about the role of electronic health records in improving the management of chronic diseases in King Fahd Medical City.

**Table (9) differences in the response level of the study sample about the role of electronic health records in improving the management of chronic diseases due to gender**

| personal characteristics      | Categories                          | N   | mean    | F-test   | P-VALUE |
|-------------------------------|-------------------------------------|-----|---------|----------|---------|
| Age                           | Less than 30 years old              | 153 | 130.039 | **43.113 | 0.000   |
|                               | From 30 to less than 40 years old   | 151 | 113.477 |          |         |
|                               | From 40 to less than 50 years old   | 82  | 99.159  |          |         |
|                               | 50years old and over                | 54  | 113.185 |          |         |
| Academic qualification        | High school                         | 66  | 106.652 | **18.464 | 0.000   |
|                               | Bachelor                            | 227 | 118.683 |          |         |
|                               | Master                              | 62  | 104.241 |          |         |
|                               | PhD                                 | 85  | 127.424 |          |         |
| Job                           | medical                             | 83  | 115.410 | *3.303   | 0.020   |
|                               | nursing                             | 90  | 110.989 |          |         |
|                               | Technical                           | 69  | 122.232 |          |         |
|                               | Administrative                      | 198 | 117.535 |          |         |
| Number of years of experience | Less than 5 years                   | 140 | 130.129 | **32.478 | 0.000   |
|                               | From 5 years to less than 10 years  | 58  | 117.345 |          |         |
|                               | From 10 years to less than 15 years | 106 | 111.736 |          |         |
|                               | 15 years and over                   | 136 | 105.927 |          |         |

It is evident that the Age variable at the level of 0.01 has a statistically significant impact on the response level of the study sample regarding the role of electronic health records in improving the management of chronic diseases. The differences were primarily in favor of individuals aged 30 to less than 40, suggesting that they are the most cognizant and in-tune with the role of electronic health records in improving the management of chronic diseases in King Fahd Medical City.

It is evident that the academic qualification variable at the level of 0.01 has a statistically significant impact on the response level of the study sample regarding the role of electronic health records in improving the management of chronic diseases. The differences were primarily in favor of PhDs, indicating that they are the most cognizant and comprehend the role of electronic health records in improving the management of chronic diseases in King Fahd Medical City.

It is evident that the Job variable has a statistically significant impact on the response level of the study sample regarding the role of electronic health records in improving the management of chronic diseases at the 0.05 level. The differences were in favor of the Technical variable, indicating that they are the most knowledgeable and comprehend the role of electronic health records in improving the management of chronic diseases in King Fahd Medical City.

The response level of the study sample regarding the role of electronic health records in improving the management of chronic diseases is statistically significant at the 0.05 level. The differences were in favor of those with less than 5 years of experience, indicating that they are the most knowledgeable and aware of the role of electronic health records in improving the management of chronic diseases in King Fahd Medical City.

## CONCLUSION AND RECOMMENDATIONS

This section will deal with Conclusion this study and Recommendations and Scope for Future Research

### A. Conclusion

1. The Electronic Health Records are at a high level, with a mean of 3.826 and a standard deviation of 1.046.
2. The management of chronic diseases is at a high level, with a mean of 4.001 and a standard deviation of 0.872.
3. There is a statistically significant impact of the Electronic Health Records on the Management of Chronic Diseases in King Fahd Medical City, with a positive correlation of 0.01 and the hypothesis being correct. The Management of Chronic Diseases in King Fahd Medical City increased by 0.377% as the Electronic Health Records level increased by 1%.
4. The gender variable at the level of 0.01 results in statistically significant differences in the response level of the study sample regarding the role of electronic health records in improving the management of chronic diseases. These differences were in favor of females, suggesting that they are the most knowledgeable and aware of the role of electronic health records in improving the management of chronic diseases in King Fahd Medical City.
5. The Age variable at the level of 0.01 results in statistically significant differences in the response level of the study sample regarding the role of electronic health records in improving the management of chronic diseases. The differences were in favor of individuals aged 30 to less than 40 years old, suggesting that they are the most knowledgeable and aware of the role of electronic health records in improving the management of chronic diseases in King Fahd Medical City.
6. The academic qualification variable has a statistically significant impact on the response level of the study sample regarding the role of electronic health records in improving the management of chronic diseases at the level of 0.01. The differences were in favor of PhDs, indicating that they are the most knowledgeable and comprehend the role of electronic health records in improving the management of chronic diseases in King Fahd Medical City.
7. The job variable has a statistically significant impact on the response level of the study sample regarding the role of electronic health records in improving the management of chronic diseases at the 0.05 level. The differences were in favor of the technical group, indicating that they are the most knowledgeable and comprehend the role of electronic health records in improving the management of chronic diseases in King Fahd Medical City.
8. The response level of the study sample regarding the role of electronic health records in improving the management of chronic diseases is statistically significant at the 0.05 level. The differences were in favor of those with less than 5 years of experience, indicating that they are the most knowledgeable and comprehend the role of electronic health records in improving the management of chronic diseases in King Fahd Medical City.

### B. Recommendations

1. It is imperative to maintain the exceptional quality of electronic health record use within King Fahd Medical City by providing all technological methods and means that enhance its capacity to use electronic health records, as well as by offering courses and training programs to employees to enhance their capabilities. Capabilities, skills, and abilities to utilize electronic health records
2. Strive to establish the technological infrastructure and provide all necessary capabilities and requirements to optimize chronic disease management.
3. Ensuring that the services provided by hospitals and health institutions are up-to-date and that they are provided at the highest quality feasible within the Kingdom of Saudi Arabia.
4. Interest in enhancing the efficiency of health services provided in hospitals and health institutions in the Kingdom of Saudi Arabia to accomplish the health service-related objectives of the Kingdom's Vision 2030.

### C. Suggested future studies

1. The study suggests a series of prospective research and studies that could be conducted.
2. Research and studies that pertain to the assessment of the extent to which electronic health records are implemented in medical institutions in the Kingdom of Saudi Arabia, as well as the identification of the most critical variables that influence their utilization and strategies for their enhancement.
3. Research and studies that pertain to the most critical variables that influence the most optimal level of chronic disease management within health institutions and hospitals in the Kingdom of Saudi Arabia.
4. Research and studies that focus on the enhancement of the efficacy and effectiveness of hospitals and health institutions in the Kingdom of Saudi Arabia.



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