Original Article

An emperical Investigation into the impact of Electronic Health Records on Healthcare Quality and Patient Safety

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ABSTRACT:

The transformative impact of Electronic Health Records (EHRs) on healthcare quality in Saudi Arabia is the main focus of this study. The study examines how to implement EHRs to improve communication, make educated decisions, and ensure patient safety. It also discusses the advantages of doing so, including increased data accessibility and cost effectiveness. Issues with security and data interoperability are looked at concurrently. The study attempts to offer perceptive viewpoints on how the healthcare industry is changing while emphasizing how EHRs might improve overall quality control. As could be seen from above table, there is a positive and significant association between the all the variables under study. Hence our first two hypotheses have been substantiated. This means investing on training program could enhance quality as well as patient safety. Likewise, provision of best infrastructure also needs huge amount of financial resources. It could be seen from the result in table 2 that EHRs explained 26% variance in enhancing HCQ in Saudi healthcare system. Goodness of fit F= 277.112 found significant at p< 0.000. This implies that one percent investment in EHR cold increase HCQ by 51.4%. Likewise, the R^2 for PST was recorded as .160 with F value 211.911 significant at 0.000, similarly for EHS, R^2 was found as 0.121& with F value 292.820 significant at 0.000, all this led us to accept our hypothesis.

Keywords: Impact of E-Health Records, Healthcare Quality, Patient Safety, Privacy and Security, Saudi Arabia

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Introduction

Reliable health records are closely linked to both the continuity of patient treatment and the general safety of healthcare. Paper-based methods have historically been used in health records to document relevant information including treatment and results. However, in order to manage the vast amounts of data pertaining to every patient who enters the healthcare system, medical organizations have been relying more and more on computerization in recent years. A promising instrument for improving primary care delivery in particular, both domestically and internationally, is the electronic health record (EHR). A clinical decision support system can be connected to an electronic health record (EHR), which is an application environment that records each patient's unique clinical data and facilitates computerized order input and clinical documentation applications. Saudi Arabia is putting a lot of emphasis on providing patients with modern medical services, including electronic health records (EHR). It's an electronic version of the patient's medical history that could include crucial clinical, administrative, laboratory, and radiological data. Numerous studies and research projects were carried out locally to assess Saudi Arabia's adoption and understanding of e-health technologies, including EHRs. However, the purpose of this study is to look into how EHRs are used by various Saudi Arabian healthcare providers and how much of an impact they have on the standard of care. Digital innovation has brought about a fundamental transformation of our world. Information technologies are becoming more and more important in the delivery of healthcare, helping to improve the quality of healthcare by addressing issues and obstacles related to health that physicians and other health professionals encounter.

A systematic computerized compilation of patient health data, including medical history, prescription orders, vital signs, test results, radiological reports, and notes from doctors and nurses, is called an electronic health record, or EHR. It streamlines the ordering procedure for medications and exams at healthcare facilities, resulting in consistent, legible, and comprehensive orders. An electronic version of a patient's medical history that may include crucial administrative, clinical, laboratory, and radiological data is called an electronic health record, or EHR. The World Health Organization (WHO) defines electronic health records (EHRs) as a system that allows patients to access their health information for the rest of their lives, especially during emergency, outpatient, and inpatient visits (WHO, 2015). Additionally, according to American Health Information Technology, an electronic health record (EHR) is viewed as a patient-centered real-time record that allows authorized individuals to access patient information securely and immediately (Health IT, 2019). In the modern world, EHRs are gradually taking the place of paper-based techniques and eventually taking over as the primary information system in healthcare facilities (Evans, 2016; Graber *et al*., 2017). Furthermore, electronic health information makes it easier for different healthcare players to store and distribute priceless health information.

Problem Statement

The adoption of electronic health records in modern healthcare systems has happened quickly, but it's still unknown how much of an impact this has on healthcare quality in Saudi Arabia. Understanding how the integration of electronic health records affects accuracy, efficiency, and patient outcomes is difficult given the changing landscape. To optimize their deployment and guarantee the accessibility of excellent healthcare services, healthcare providers must carefully consider the consequences of electronic health records on healthcare quality as they negotiate this technological transformation.

Objectives

1. To assess the impact of Electronic Health Records (EHRs) on the improvement of care quality, focusing on communication efficiency, access to patient information, and informed decision-making among clinicians
2. To examine the influence of Electronic Health Records (EHRs) on patient safety procedures, specifically evaluating the effectiveness of features such as reminders, alerts, and incident reporting in mitigating medical errors and fostering a safety culture.
3. To investigate the benefits and challenges associated with the adoption of Electronic Health Records (EHRs), with a particular emphasis on cost efficiency, data storage, security, and accessibility, as compared to traditional paper-based medical records.

Research Questions

RQ-1: How does the utilization of Electronic Health Records (EHRs) is related to quality of care and patient safety, in terms of communication among clinicians, efficient access to patient information, and informed decision-making?

RQ-2: In what ways do Electronic Health Records (EHRs) enhance patient safety procedures, and how do features such as reminders, alerts, and incident reporting contribute to mitigating medical errors and fostering a safety culture within healthcare settings?

Literature Review

A qualitative study was carried out by Altuwaijri (2011) to describe the Ministry of National Health Guards' (MNGHA) experience adopting the EHR. Three locations of Saudi Arabia were the first to get the MNGHA's vision for the EHR's deployment. In order to implement the framework, the MNGHA administration subsequently formed project committees and a project team. The 2010 Middle East Excellence Award was given to the planning and implementation procedures, which took roughly ten years (Altuwaijri, 2011). Examine the factors influencing the acceptance and deployment of electronic health record (EHR) systems in Saudi Arabia among consumers and healthcare providers. Al-Rayes *et al.* (2019) carried out a cross-sectional quantitative study on healthcare providers using a paper survey given to a group of 213 physicians.

With new research highlighting their effects on quality management, electronic health records, or EHRs, have emerged as essential instruments in today's healthcare system. (Silow-Carroll, Edwards, & Rodin, 2012) investigated the experiences of leading hospitals in utilizing EHRs to enhance quality and efficiency. Their results highlight the benefits of integrating electronic health records, highlighting increases in both operational effectiveness and care quality. Examining the crucial topic of information integrity in EHR systems and evaluated how it affected healthcare quality and safety. "Impact of Electronic Health Record Systems on Information Integrity," (Bowman, 2013) emphasizes how important it is to preserve data integrity in order to guarantee patient safety and high-quality care. (Manga and Sun (2020), who looked at the connection between patient empowerment and the sharing of electronic health record systems, offer a more contemporary viewpoint. Their design-oriented methodology offers valuable perspectives on how to utilize EHR systems to empower patients, ultimately leading to better patient experiences. Taken as a whole, these studies provide a sophisticated picture of the complex relationship between EHR effectiveness, information integrity, and patient empowerment and healthcare quality.

Importance of Health Informatics and E-Health in Saudi Arabia

When it comes to implementing the newest medical technology, Saudi Arabia has led the way. In light of this, Saudi Arabia has acknowledged the advantages of e-health and health informatics in the provision of medical services. It is making every effort to guarantee that the technology is sufficiently applied in a variety of contexts. The use of e-Health/health informatics techniques in Saudi Arabia, such as electronic health records (EHR), clinical decision support systems (CDSS), electronic medical health records (EMR), and computerized provider order entry (CPOE), is enhancing patient-provider interactions and facilitating patient access to health records and information (Altuwaijri, 2010).

The Significance of Electronic Health Records

EHRS's positive impact on basic healthcare were evident almost immediately. It has been proposed that the adoption of Electronic Health Records (EHRS) will improve both the distribution of health records among authorized users and their accessibility. EHRS can also immediately impact healthcare quality and enhance the financial and administrative capacities of all healthcare organizations. EHR helps with clinical tasks by minimizing the loss of critical data and providing the freedom to complete documentation requirements even when a clinician is not present. Through clearer communication, EHR can also aid in enhancing provider understanding. (Upadhyay, & Hu, 2022).

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Enhanced Quality of Care

Because EHR allows doctors to examine patients' medical histories and procedures, as reported by our respondents, it facilitates more efficient communication between patients and providers. Also, respondents mentioned that it is simpler to locate relevant information and read textually. EHR facilitates improved communication and understanding between practitioners from various specialties, including doctors, nurses, and therapists. According to the respondents, the EHR facilitates their work by giving them enough patient data even before the patient is seen. Additionally, respondents stated that a more thorough clinical history of patients is provided by having a single system where all patient records are located. Therefore, respondents believed that having an EHR enables clinicians to make wise decisions and enhance patient outcomes. EHR has made quarterly or monthly reporting easier to handle, which has increased the effectiveness of improvement initiatives. (Upadhyay, & Hu, 2022).

Enhancement of Safety of Patients

Leaders in patient safety believed that electronic health records (EHRs) improve patient safety practices by streamlining the record-request process. According to the surgeon, patient safety is promoted and mistakes are prevented when medical history, surgical notes, surgical operation data, and examination details are readily available. Furthermore, the ability to record incidents in the event of injuries and falls strengthens the safety culture by allowing for ongoing changes based on the incident reports. Having an EHR makes it possible to analyze data for research and apply the results to enhance patient safety. Additionally, there exist prospects for the advancement of EHR in terms of enhancing patient safety. For example, EHR can create "safety dashboards" for patients and collect data on patients' vulnerability to illnesses acquired in hospitals. In general, the reminders, alerts, and notifications that EHR provides increase patient safety. According to data analytics advancements, EHR can enhance safety even further by providing predictive alerts and reminders. Although there haven't been many research looking into using EHR data for predictive analysis, it's reasonable to anticipate that EHR development will be moving in a new way going forward. However, concerns about security and privacy present fresh difficulties for the creation of EHRs and data analysis. (Upadhyay, & Hu, 2022).

Privacy and Security

Only with consent from the patient or as permitted by law may information about them be disclosed to third parties. The patient's legal representative or guardian should make decisions on information sharing when the patient is unable of doing so due to old age or mental disability. Confidential information exchanged during a clinical encounter needs to be safeguarded. Information that cannot be used to identify a patient, such as the total number of breast cancer patients in a public hospital, does not fall under this category. (Ozair, Jamshed, Sharma, & Aggarwal, 2015).

Benefits and Development

Comparing electronic health records to the present paper-based approach, there are numerous benefits. They enable the gathering of electronically accessible, coded, and structured data that can be utilized to compile comprehensive longitudinal histories of a patient's medical experiences. Because a single patient's interactions are frequently provided at several clinical locations and recorded in site-specific paper charts that are only accessible locally, paper records contribute to the fragmentation of care. Decision support systems are also made possible by structured coded electronic data, which helps to monitor and enhance the healthcare delivery process. Electronic health records can be transmitted for data exchange and accessed from several locations at once due to EHRs.

EHRs also force a certain level of uniformity and standardization on healthcare delivery, which contributes to the transition of the healthcare sector to a more evidence-based care model. Cost, storage, security, and access are the four main advantages of using electronic health records (EHRs) over paper-based medical data (Carpathia, 2013). First, fewer employees will be needed to manage EHRs, and there will be no longer be a need for big physical storage areas for record keeping. As a result, using this way to handle and keep records is less expensive. Secondly, record preservation becomes a problem as patient numbers rise. Paper medical records must be physically produced on paper, and their storage frequently requires huge physical locations. They are also readily destroyed and deteriorated.

However, electronic health records (EHRs) do not need to be printed on paper, which saves a lot of room in the physical storage.

 Third, whereas paper records are typically kept in file cabinets with less protection, electronic health records (EHRs) can be kept in a more secure location, like the cloud, and can be watched for any suspicious access. Natural calamities like floods and fires have the potential to corrupt or pilfer the files. We require backups in order to be ready for any loss. While paper records need photocopy backups, sorting, and binding the copies together, electronic health records are easily copy able. Lastly, it takes a lot of time to ship or scan paper medical records and send them via email in order to access them (Yi, 2018).

Principal Problems with EHRs in Healthcare

1. **Interoperability of data**

Employing EHRs benefits healthcare-related enterprises in a number of ways. Nevertheless, if EHR interoperability across many health systems could be attained, those benefits would increase. Aspects of medical records are preserved when they are kept or retrieved.

2. **Privacy**

Malicious code poses a hazard to EHR systems, and these systems may have numerous security flaws. To reduce vulnerability and ensure that risk and controls are balanced to safeguard the system and maintain business operations, vulnerabilities in software and hardware must be fixed.

3. **Business Regularity**

This refers to an organization's capacity to carry out critical tasks both during and following a disaster. The availability of EHRs can be disrupted by a number of things, including network failure, data loss, hardware failure, software failure, and assaults. EHRs must always be accessible via the network in order for the business to run smoothly. (Yi, 2018).

Method

Observed what is already known about the implementation of EHRs in the chosen healthcare institutions through case studies, papers, research publications, and other materials. Examined papers that are available to the public, including corporate communications, implementation plans, and yearly reports. Primary data was collected from the sample respondents in Qassim region using cross sectional survey and structured questionnaire.

Ethical Considerations

Give ethical issues first priority when investigating how Electronic Health Records (EHRs) affect healthcare quality management. Get informed permission, protect personal information, and put strong data security in place. Reduce prejudices, uphold openness, and weigh the pros and cons. Maintain the integrity of research, involve the medical community, and carry out ethical reviews for new and developing technologies on a regular basis.

List of Variables

- Dependent Variables: Healthcare quality management outcomes.
- Independent Variables: Implementation and utilization of Electronic Health Records (EHRs), demographic characteristics of healthcare professionals.

Results and Discussion

To test the hypothesis, we have used the study has used correlation and linear regression analyses.

Association Between Predictors and Criterion Variables

H₁: All the predictors and criterion variables are positively and significantly correlated with one another.

Table 1

Association

	1	2	3	4
EHR	1			
HCQ	.514**	1		
PST	.401**	.515**	1	
EHS	.348	.662**	.691**	1

** Significant at 0.01 level

HER (*Electronic Health Record*), HCQ (*Healthcare Quality*), PST (*Patient Safety*), EHS (*Effective Healthcare System*).

As could be seen from above table, there is a positive and significant association between the all the variables under study. Hence our first two hypotheses have been substantiated. This means investing on training program could enhance quality as well as patient safety. Likewise, provision of best infrastructure also needs huge amount of financial resources.

Regression Analysis

H₂ There is a significant improvement using EHRs in improving the quality, patient safety, and healthcare system.

Table 2

Regression Results

DV	IV	R	R^2	F	Beta	p
HCQ	Constant	.514	.264	277.112	.514	0.000
PST	Constant	.401	.160	211.911	.401	0.000
EHS	Constant EHRs	.348	.121	292.820	.348	0.000

HCQ: Healthcare Quality
PST: Patient Safety
EHS: Effective Healthcare System
EHRs: Electronic Health Records

It could be seen from the result in table 2 that EHRs explained 26% variance in enhancing HCQ in Saudi healthcare system. Goodness of fit F= 277.112 found significant at p< 0.000. This implies that one percent investment in EHR cold increase HCQ by 51.4%. Likewise, the R^2 for PST was recorded as .160 with F value 211.911 significant at 0.000, similarly for EHS, R^2 was found as 0.121& with F value 292.820 significant at 0.000, all this led us to accept our hypothesis.

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Discussion and Conclusion

The influence of EHRs in Saudi Arabia sheds light on the relationship between healthcare quality and digital health records. It places a strong emphasis on cost effectiveness, increased patient safety, and better communication. The literature review acknowledges problems such as the requirement for computer expertise while highlighting both local and global viewpoints. The study recognizes that EHRs have a positive impact on healthcare and takes into account aspects like patient empowerment and data integrity. Interoperability issues and privacy concerns are among the challenges. The selected methodology entails a thorough examination of the body of knowledge via papers and case studies. The practical ramifications entail guiding quality improvement projects, professional education programs, and healthcare policies. All things considered, the study helps with decision-making when integrating digital healthcare systems. In conclusion, the increase in patient safety and general care quality is one important effect of EHRs. Healthcare professionals may make better decisions, prevent unnecessary testing, and guarantee prompt treatments when they have access to thorough and conveniently available patient records. Proactive care of chronic illnesses is made easier by the capacity to track and analyze data within EHR systems, which improves long-term results. The state of EHRs is constantly evolving on a global scale. However, the various statuses of EHRs around the world vary depending on the standards in those respective nations. In Saudi Arabia, there is a strong focus on using electronic health records to benefit patients. Numerous studies and research projects were undertaken to gauge Saudi Arabia.

Future Research Implications

Theoretical Implication

Progress in Health Information Systems Theory: By examining the revolutionary influence of Electronic Health Records (EHRs) on healthcare quality management, the research advances health information systems theory. Improvement of Communication Theory: Results could be useful in enhancing communication theories in healthcare environments, especially with regard to how EHRs facilitate better communication amongst physicians. Development of Decision-Making Theories: Understanding how EHRs support well-informed decision-making can lead to an expansion of healthcare decision-making theories. For theoretical frameworks, it can be helpful to comprehend the variables impacting decision-making processes in the context of EHR utilization.

Practical Implications

Policy and Management in the Healthcare Industry: The study offers useful information to decision-makers in the healthcare industry. Policy makers can design more effective EHR deployment and utilization by taking into account the effects of EHRs on the quality of care. Health Care Organizations' Quality Improvement Initiatives: The study's conclusions can direct these kinds of efforts. To improve care quality, patient safety, and the overall effectiveness of the healthcare system, tactics to take use of EHR capabilities must be customized. Training and Education Programs: The study's conclusions can be used to modify the training and educational initiatives for healthcare workers. By focusing on topics including improving communication, patient safety protocols, and resolving adoption hurdles, this guarantees that practitioners are prepared to use EHRs efficiently.

Recommendations

Further investigation and monitoring are advised to examine the quality and accessibility of EHR in Saudi Arabian hospitals, as well as the services provided to patients and medical professionals. When implementing EHRs, healthcare companies should take a strategic approach and match technological integration with their overarching organizational objectives. Promote cooperation between healthcare institutions in order to exchange best practices for the implementation of EHRs. Create plans to involve patients in the EHR process, making sure they understand the advantages and that their privacy concerns are taken care of. Give strong data security measures top priority in order to allay worries about confidentiality and privacy. To prevent unwanted access to patient data, put encryption.

Deceleration of Interest

The author declares that there was no clash of interest.

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