

EXPLORATORY STUDY ON IMPLEMENTATION OF ELECTRONIC HEALTH RECORDS (EHR) APPLICATIONS IN HOSPITALS OF KUWAIT DURING COVID 19

Aya Mohamed¹,

Student of IIBM,

under DBA Program

Simerjeet Singh Bawa²

Professor,

Chitkara Business School, Chitkara University, Rajpura, Punjab

ABSTRACT:

The examination of this thesis focuses on how Electronic Health Records (EHR) systems were implemented in Kuwaiti hospitals during the COVID-19 pandemic and evaluates their effects on healthcare efficiency, outcomes and digital transformation. The study reveals Kuwait's healthcare system faces serious issues with EHR technology including interoperability gaps, cybersecurity threats, and inconsistent acceptance among stakeholders. Through the use of EHR systems this research examines how patient care can be improved while operations are streamlined along with modernizing healthcare delivery throughout Kuwait.

The research study uses mixed methods to combine numeric survey results with professional feedback from healthcare workers and IT specialists and administrators. Quantitative data measures satisfaction levels and cybersecurity confidence alongside perceived EHR system effectiveness while qualitative results reveal adoption barriers and facilitators. The study analyses how EHR systems work with new technologies such as telehealth to support uninterrupted patient care throughout the pandemic period.

Research evidence shows that EHR systems hold transformative potential for eliminating systemic inefficiencies while enhancing care coordination. The research generates practical suggestions to boost system interoperability alongside cybersecurity improvements and stakeholder training to support engagement. The research provides academic insights and practical approaches for healthcare officials and policymakers to establish a robust technology-enabled healthcare environment focused on patient needs in Kuwait. According to its comprehensive analysis the thesis shows that ongoing financial support for EHR systems leads to lasting improvements in healthcare delivery.

Keywords:

Healthcare systems have transformed globally due to Electronic Health Record systems that enhance patient information management through improved efficiency and accuracy.

Introduction

Background and Context

EHR systems changed global healthcare through better efficiency, accuracy, and patient information accessibility. Healthcare providers use these systems to simplify operations and improve care coordination while simultaneously decreasing medical errors which leads to better patient outcomes. The adoption of Electronic Health Record systems in developed countries showed exceptional effectiveness during healthcare delivery operations specifically during pandemic events like COVID-19. The COVID-19 pandemic demonstrated Kuwait's critical demand for digital health infrastructure to manage increased patient numbers as well as deal with broken health information systems and poor interoperability between medical facilities.

The implementation of EHR systems in Kuwait faces numerous obstacles such as technical difficulties together with organizational and cultural problems despite the systems' possible advantages. Healthcare facilities throughout the region do not have standardized data sharing protocols which leads to difficulties integrating EHR systems seamlessly. The adoption rate of healthcare technologies has been delayed by healthcare professionals' reluctance to change along with inadequate training programs. Both healthcare providers and patients have developed concerns about data security and privacy which make the move to digital systems even more challenging. Successful resolution of these problems needs a comprehensive strategy encompassing government backing together with stakeholder involvement and financial commitments to both infrastructure and training programs.

During the COVID-19 crisis Kuwait's healthcare facilities experienced a rapid increase in the implementation of EHR systems. During the crisis hospitals had to implement digital solutions to ensure efficient patient data management and resource allocation while maintaining continuity of care. The recent transition has revealed essential information about what enables and what hinders effective EHR deployment. The experience gained in this period demonstrated that interoperability needs to be coupled with robust cybersecurity measures and intuitive system design to achieve broad acceptance of EHR systems. The insights gained from current events allow Kuwait to create strategies that strengthen healthcare resilience and modernization which will support future advanced digital health technology integration.

Research Questions

This study seeks to address the following key research questions:

- **What is the current level of interoperability among Electronic Health Record (EHR) systems in Kuwaiti hospitals, and what strategies can enhance seamless data sharing?**

This question aims to assess the technical and operational barriers to data exchange and identify solutions to improve care coordination and patient outcomes.

- **What cybersecurity measures are necessary to ensure the privacy and security of patient data in EHR systems used in Kuwait?**

By evaluating existing vulnerabilities and best practices, this question explores strategies to safeguard sensitive patient information while building trust in digital health platforms.

- **What are the key factors influencing healthcare professionals' acceptance and use of EHR systems in Kuwaiti hospitals, and how can resistance to change be addressed?**

Understanding the reasons behind user resistance and identifying targeted solutions will be critical to increasing engagement and improving system adoption.

- **How can EHR systems be integrated with telehealth and remote monitoring technologies to improve healthcare accessibility and patient outcomes in Kuwait?**

This question investigates the technical and organizational requirements for creating a connected health ecosystem that supports innovative care delivery models.

- **What lessons can be learned from EHR implementation during the COVID-19 pandemic in Kuwait to guide future strategies for digital transformation in healthcare?**

Analyzing the successes and challenges encountered during the pandemic will help develop actionable insights to strengthen future EHR adoption.

- **What role do training programs and technical support play in optimizing the adoption and long-term usage of EHR systems by healthcare providers in Kuwait?**

This question evaluates the impact of continuous education and support systems on user proficiency and overall system effectiveness.

- **How can government initiatives and stakeholder collaboration drive the widespread adoption of standardized EHR systems across Kuwait's healthcare facilities?**

By examining the roles of policymakers, healthcare providers, and IT vendors, this question aims to highlight collaborative approaches to overcoming systemic challenges.

Research Objectives

The objectives of this study are:

1. **To evaluate the current state of Electronic Health Record (EHR) systems in Kuwait and identify opportunities for improvement.**
 - This objective focuses on analyzing the strengths and weaknesses of existing EHR infrastructure and services to enhance interoperability, usability, and effectiveness in healthcare delivery.
2. **To assess the impact of EHR systems on the efficiency and quality of healthcare services in Kuwait.**

- This involves examining how EHR tools improve care coordination, reduce medical errors, and streamline clinical workflows while identifying areas for optimization.
- 3. **To explore the challenges and opportunities in implementing EHR systems in Kuwait's hospitals.**
 - This objective seeks to identify technical, organizational, and cultural barriers to EHR adoption and leverage facilitators such as training programs, stakeholder engagement, and government support.
- 4. **To investigate the integration of EHR systems with telehealth and remote monitoring technologies in Kuwait.**
 - This includes analyzing the technical and operational requirements for creating a connected health ecosystem that enhances accessibility and patient outcomes.
- 5. **To propose strategies for overcoming resistance to EHR adoption among healthcare professionals.**
 - This objective focuses on understanding the factors contributing to resistance and developing targeted solutions, such as user-friendly designs and comprehensive training programs.
- 6. **To recommend cybersecurity measures to safeguard patient data in EHR systems.**
 - This involves evaluating existing vulnerabilities and proposing advanced security protocols to enhance data protection and build trust in digital health platforms.
- 7. **To identify lessons learned from EHR implementation during the COVID-19 pandemic and apply them to future digital transformation initiatives.**
 - This objective emphasizes leveraging pandemic experiences to develop strategies that ensure resilience, efficiency, and scalability in Kuwait's healthcare system.

Methodology Overview

During the COVID-19 pandemic this study used a mixed-methods approach to thoroughly assess how Electronic Health Records (EHR) systems were adopted, integrated and impacted Kuwaiti hospitals. The research methodology combines qualitative and quantitative techniques to achieve a comprehensive analysis of the research objectives and questions.

Research Design:

We selected an exploratory research design to examine the obstacles and facilitators along with the results of EHR deployment in Kuwait. The research design enables detection of healthcare infrastructure gaps and evaluation of stakeholder perceptions about EHR systems for operational efficiency and patient care enhancement. The exploratory research approach leads to a detailed understanding of technical and organizational as well as cultural obstacles to EHR implementation.

• Data Collection:

o **Primary Data:** Data collection methods included structured surveys and in-depth interviews with healthcare professionals along with administrative staff and policymakers in Kuwait.

- **Surveys:** The survey structure used closed-ended questions to gather quantitative data about EHR adoption rates and usage patterns along with perceived challenges and open-ended questions to obtain qualitative information regarding user experiences and system improvements.
- **Interviews:** Semi-structured interviews with stakeholders revealed detailed information about their perspectives and expectations as well as their concerns about EHR systems.

o **Secondary Data:** Through examinations of pertinent academic literature along with government publications and international case studies this research gained a contextual understanding of best practices for EHR systems and their potential application in Kuwait.

• Data Analysis:

- o **Quantitative Analysis:** The research team applied both descriptive and inferential statistical methods to find trends and connections across survey data. Researchers used correlation and regression analyses to study how training effectiveness affected system usability and adoption rates.
- o **Qualitative Analysis:** The research used thematic analysis to process interview and open-ended survey data to discover common themes as well as challenges and opportunities that emerged during EHR system implementation.

• **Hypothesis Testing:**

Research hypotheses were established to study key variable relationships like system training's effect on user satisfaction as well as how interoperability affects healthcare efficiency and cybersecurity measures impact stakeholder trust.

• **Ethical Considerations:**

Before collecting data researchers explained participants' rights and acquired informed consent from them. Data confidentiality and anonymity were strictly maintained. All research activities followed ethical guidelines which maintained transparency along with respect and integrity.

Through comprehensive methodology we obtain robust evaluations of EHR systems in Kuwait which lead to actionable recommendations for improving their adoption and integration to boost healthcare delivery effectiveness.

Significance and Relevance

Deploying Electronic Health Record (EHR) systems in Kuwaiti hospitals presents revolutionary opportunities to solve healthcare issues that became evident throughout the COVID-19 pandemic. The healthcare system in Kuwait suffers from fragmented data management systems together with inefficient care delivery processes and restricted access to consolidated health information. Advanced digital technologies back EHR systems that deliver innovative solutions to boost care coordination while enhancing data accuracy and reducing workflow complexities. The study proposes a framework which will modernize Kuwait's healthcare infrastructure to match international digital health standards while enhancing patient outcomes.

This research matters because it supports Kuwait's healthcare goals which focus on system efficiency together with patient safety and accessible care. Despite Kuwait's substantial investments in healthcare infrastructure development, problems including uneven digital tool adoption and stakeholder resistance to change continue to exist. This research examines EHR systems integration which fills existing gaps and identifies methods to surpass adoption barriers. This research enhances knowledge about health technology implementation throughout the Middle East and gives practical advice to key stakeholders such as policymakers and healthcare professionals.

This research extends beyond Kuwait to impact healthcare systems worldwide that experience comparable challenges. The research shows effective approaches to using technology for improved healthcare delivery in areas with a mix of cultural and organizational frameworks. The study advances digital health research by pinpointing both facilitators and barriers to EHR implementation. Researchers and healthcare professionals as well as policymakers working on healthcare system modernization and population health improvement through technology can benefit from these findings.

Literature Review

Healthcare delivery now depends heavily on Electronic Health Record systems and additional Healthcare Information Technology tools. Healthcare Information Technology which includes EHRs along with telemedicine platforms and predictive analytics leads to better operational efficiency and improved care coordination along with enhanced patient outcomes (Raghupathi & Raghupathi, 2014). Healthcare providers can obtain accurate real-time data through these technologies which results in reduced redundant processes and better decision-making outcomes. During emergency circumstances like the COVID-19 pandemic EHR systems showed their utility by enabling healthcare systems to manage patients remotely and optimize resources. This study examines how the implementation of EHR technology in Kuwait could solve current healthcare system inefficiencies.

Even though Kuwait possesses advanced healthcare capabilities in some areas its system still struggles with fragmentation issues along with data management problems and minimal digital solution adoption. Kuwait's healthcare system mainly depends on government funding as Al-Azmi et al. (2019) highlight slow digital health implementation due to regulatory obstacles and healthcare professionals' reluctance to adopt new technologies. The World Health Organization (2016) emphasized the essential contribution of Health Information Technology (HIT) to improve healthcare access and operational effectiveness in areas with fast population increases and higher healthcare needs. This research investigates the implementation of EHR systems in Kuwait by examining their integration with the healthcare infrastructure to enhance service delivery.

Successful HIT solution implementation depends on stakeholder engagement because healthcare systems need to experience both cultural and operational changes during adoption. Mechanic and Schlesinger's (1996) research underline that successful digital transformation efforts depend on the acceptance and cooperation from healthcare providers alongside policymakers and patients. The adoption of HIT solutions in Kuwait faces obstacles such as data privacy issues alongside EHR system complexity and workflow changes according to Vest & Gamm (2010). The research identifies multiple strategies to tackle these barriers which include robust training programs, transparent communication, and aligning HIT initiatives with stakeholder needs.

The global combination of HIT with managed care systems shows measurable benefits such as enhanced patient outcomes alongside cost efficiency and preventive care according to Kruse et al. (2018). Research comparing healthcare systems indicates that countries with developed HIT infrastructures achieve better health outcomes and lower costs (Shortliffe & Cimino, 2013). The examples provided function as reference standards for Kuwait's healthcare system by showing best practices alongside potential challenges. The research expands HIT understanding through an evaluation of EHR deployment feasibility and effects within Kuwait using lessons from international achievements to develop regional digital health transformation strategies.

Methodology

Research Design and Approach

The study utilizes an exploratory research design which fits perfectly with the investigation of Electronic Health Record (EHR) adoption in Kuwaiti hospitals during the COVID-19 pandemic because this topic requires an adaptable approach. The exploratory research approach helps reveal information about the practicality and difficulties as well as potential benefits of EHR system implementation. The study achieves a complete examination of the subject through the combination of qualitative and quantitative research methods. The qualitative approach investigates stakeholder perspectives and experiences and the quantitative component examines numerical trends and relationships to provide balanced and comprehensive research objectives.

The study utilizes mixed-methods research by gathering primary data through structured surveys and semi-structured interviews and secondary data through literature review and case studies analysis. The study uses this approach to detect shortcomings in Kuwait's healthcare system while comparing results against international digital health transformation standards. Research remains connected to real-world situations through stakeholder input which improves both relevance and practical application of study results.

Data Analysis Techniques

The research applied quantitative and qualitative analysis techniques to fully understand the findings and extract practical insights.

• Quantitative Analysis:

- o **Descriptive Statistics:** Data from surveys was processed through descriptive statistics to identify primary trends about EHR adoption along with stakeholder attitudes and system usability. Through this analysis healthcare professionals' familiarity with EHR systems was assessed along with their perceived benefits and challenges.

- o **Correlation Analysis:** Researchers conducted correlation analysis to discover relationships between variables such as training impact on system adoption and perceived usability effects on stakeholder acceptance.

- o **Hypothesis Testing:** The study conducted statistical tests on specific hypotheses such as the positive relationship between strong training programs and EHR adoption success to support assumptions and develop focused recommendations.

• Qualitative Analysis:

- o **Thematic Analysis:** Researchers used thematic analysis to code open-ended survey responses and interview transcripts which revealed common themes including implementation barriers such as data privacy concerns and resistance to change along with facilitators like government support and stakeholder engagement.

o **Comparative Analysis:** The research contrasted qualitative findings from Kuwaiti hospitals with global case studies to determine EHR integration challenges and successful practices. Implementation lessons from other countries' successes were modified for use in Kuwait.

The research uses these methods to provide a comprehensive analysis of EHR implementation which includes both quantitative results and qualitative stakeholder feedback. Through this intensive methodology the research outcomes gain validity and practical applicability which enable the formulation of actionable recommendations to improve Kuwait's healthcare system.

Ethical Considerations

Ethical standards in this research were strictly followed to preserve participant rights and uphold research integrity. Before collecting any data researchers explained the study purpose and participant roles to subjects who then provided informed consent. We protected participant confidentiality and anonymity through data encryption or the removal of identifiable information while securing all responses so that they remained accessible solely to authorized staff. Every participant received confirmation their withdrawal could occur at any point during the study without repercussions. Research followed academic integrity guidelines by responsibly using secondary data with appropriate citations and acknowledgments. The implemented measures protected participant confidentiality while building trust and maintaining adherence to international ethical research standards.

Results

The results are presented in two sections: The study results are divided into qualitative findings and descriptive findings which together deliver a full analysis of the difficulties, potential benefits and effects of Electronic Health Record (EHR) system implementation in Kuwait. The research outcomes confirm the defined objectives and hypotheses and provide information about how practical and successful EHR adoption is within Kuwait's healthcare system.

Qualitative Findings

Insights from open-ended survey responses and literature review identified key themes influencing the adoption and integration of EHR systems:

• Challenges in EHR Adoption:

- o **Training Deficiency:** Multiple participants called for structured training programs that continue after initial instruction. Respondents who make up 35% of the study population cited inadequate training as a crucial obstacle to effective EHR implementation which shows how essential proper training is for healthcare professionals to achieve system proficiency.

- o **Data Privacy Concerns:** Around 40% of survey participants showed concern about data protection and patient confidentiality as it relates to centralized systems such as EHRs which shows the necessity for strong cybersecurity implementations.

• Perceived Benefits of EHR Systems:

- o Enhanced Care Coordination: Respondents identified improved patient care continuity and real-time access to patient data as major advantages of EHR systems because these systems eliminate redundant operations and support evidence-based clinical decisions.
- o Operational Efficiency: Participants reported that digital health technologies allowed their organizations to achieve cost savings through more efficient workflows and better resource management.

• Stakeholder Support:

- o Government Involvement: Government-led financial and regulatory support stands out as essential to respondents who reported 60% of them saw it as key to overcoming EHR system adoption barriers.

Descriptive Findings

Through quantitative analysis we obtain precise numerical insights from survey data to test research hypotheses and discover patterns.

Variable	Mean	Std Dev	Key Insight
Familiarity with EHR Systems	3.8	0.89	Moderate familiarity indicates need for enhanced training programs.
Perceived Effectiveness	4.2	0.81	High perceived value of EHR in improving care delivery and efficiency.
Importance of Training	4.5	0.63	Strong consensus on the necessity of structured training initiatives.
Concern about Data Privacy	4.4	0.77	Elevated concerns about privacy highlight the need for robust security measures.
Support for Government Incentives	4.7	0.62	Strong endorsement of government involvement to facilitate adoption.

Hypothesis Testing and Outcome

- **H0 (Null Hypothesis):** Structured training in EHR systems does not significantly affect the likelihood of successful adoption in healthcare facilities according to the Null Hypothesis.
- **H1 (Alternative Hypothesis):** Structured training in EHR systems positively correlates with successful adoption outcomes in healthcare facilities according to the alternative hypothesis.

Statistical Analysis:

- **Correlation Coefficient (r):** The statistical analysis reveals a correlation coefficient of 0.65 which shows a strong positive relationship.
- **P-Value:** The p-value is 0.001 which meets the threshold for statistical significance at $\alpha = 0.05$.

Interpretation:

Structured training creates a substantial effect on how well healthcare facilities implement EHR systems according to the positive correlation coefficient. Because the p-value is low we confirm statistical significance which results in rejecting the null hypothesis and accepting the alternative hypothesis. The evidence shows that training programs are essential for healthcare professionals to acquire the skills and confidence required for effective EHR system utilization.

Discussion

Training and EHR Adoption:

The findings show that training strongly correlates with adoption success which emphasizes the need for well-planned capacity-building programs. Stakeholders repeatedly stressed the need for practical training programs which are customized to meet their specific requirements. Research by Kruse et al. (2018) among other global studies confirms that users gain better proficiency and confidence in digital health technologies through comprehensive training.

Data Privacy Concerns:

A high level of concern about data privacy (average score: The survey showed data privacy concerns ranked highest at an average score of 4.3 which became a major obstacle to EHR deployment. The results indicate skepticism about centralized data systems alongside fears of possible security breaches. The results make it clear that strong data protection strategies are necessary along with strict regulatory guidelines and international security compliance standards. Stakeholders must have clear information about protective measures to develop trust.

Role of Government Incentives:

The research indicates strong support for government incentives as shown by an average rating of 4.6 which emphasizes their critical role in promoting adoption. Stakeholders considered financial support through subsidies and grants essential for covering implementation expenses. Healthcare facilities needed regulatory EHR integration requirements to meet national objectives. Global

practices show that health information technology has advanced through government-directed initiatives.

Integration into Kuwait's Context:

For Kuwait, the findings indicate actionable pathways to overcome existing barriers:

- **Familiarity and Training:** System adoption rates improve when structured training programs fill technical expertise gaps to boost system usability.
- **Privacy and Policy Frameworks:** Stakeholder concerns will lessen and trust will increase through the implementation of strong data protection measures.
- **Government Leadership:** Sustainable and scalable EHR systems integration requires proactive financial and regulatory backing from the government.

Implications and Significance

This study shows how Electronic Health Records (EHR) systems can modernize Kuwait's healthcare network through effective implementation. Successful EHR system implementation requires addressing training gaps along with data privacy issues and government incentive needs. Electronic Health Records systems present Kuwait's healthcare sector with a transformative solution that enhances care coordination while streamlining operations and improving patient outcomes. According to this research policymakers and healthcare providers obtain practical guidance to develop systems that deliver efficient and accessible care while focusing on patient needs. These findings extend beyond Kuwait to support international discussions about digital health by proposing a framework for using EHR technologies in comparable healthcare systems to achieve lasting and scalable improvements in healthcare delivery.

Limitations and Potential Biases

This study provides useful information about Electronic Health Record (EHR) system adoption in Kuwait, but researchers need to recognize its limitations and potential biases. Self-reported survey data exposes research to social desirability bias because participants may give socially acceptable answers instead of their true thoughts. Recall bias may compromise response accuracy since participants might struggle to remember their EHR system experiences or familiarity levels. The reliability of the study findings might be affected by these elements.

The chosen sample size works well for exploratory research but fails to represent the full range of stakeholders in Kuwait's healthcare system. Research results could be biased because smaller clinics or rural healthcare providers might lack adequate representation which favors outcomes from urban or well-funded institutions. Since the study examines only one geographic and healthcare environment its results cannot be applied to places that have different healthcare systems or levels of technological advancement.

The study faces a limitation because secondary data used to contextualize findings might not capture the latest changes in Kuwait's healthcare system that the COVID-19 pandemic brought. Qualitative insights offer in-depth understanding but fail to provide statistical rigor for wider application and the survey questions along with response interpretation may introduce unintentional biases which affect the results. Future research should address current limitations by increasing sample diversity while also implementing longitudinal studies and broadening comparative analyses in different settings. The research provides practical guidance and a base structure for EHR system integration in Kuwait's healthcare system even though it has certain limitations.

Comparison with Existing Research

The findings of this study match global research including Raghupathi and Raghupathi's work (2014) which demonstrates how Healthcare Information Technology (HIT) serves as a transformative tool for better care coordination and operational efficiency along with improved patient outcomes. The research demonstrates how Electronic Health Record (EHR) systems can modernize healthcare delivery in Kuwait. This research offers a regional viewpoint by examining Kuwait-specific challenges such as data privacy concerns and the essential requirement for government incentives to encourage adoption. This study emphasizes structured training programs and stakeholder engagement as essential methods to address the barriers of resistance to change and system integration lack which Vest and Gamm (2010) previously identified.

Previous studies mainly examine technologically advanced nations but this research expands our understanding through HIT implementation analysis within Kuwait's developing healthcare structure. The research combines worldwide best practices with local knowledge to solve a key knowledge gap about HIT feasibility and impact in areas with limited resources. Research shows that customized HIT solutions can greatly improve healthcare delivery and access through implementable recommendations which draw from worldwide expertise yet remain suitable for local application.

Conclusion

Summary of Main Findings

Research proves Electronic Health Record (EHR) systems as both practical and highly advantageous for Kuwait's healthcare industry. The research shows that users who understand EHR systems believe these systems are more effective and structured training programs are essential for successful implementation. Successful implementation requires robust regulatory frameworks and financial incentives because major challenges like data privacy concerns and the need for government support exist. The study confirms that EHR systems can transform healthcare by resolving inefficiencies and coordinating care better while improving patient outcomes which sets a path for modernizing Kuwait's healthcare system.

Restatement of Research Questions and Objectives

The study investigated essential topics about implementing Electronic Health Record (EHR) systems in Kuwait by examining healthcare IT infrastructure status along with stakeholder views and responsibilities and evaluating EHR integration approaches together with their advantages and implementation obstacles.

The study set out to examine current healthcare systems while measuring the effect of EHR systems on operational efficiency and patient results and to discover obstacles and possibilities for effective EHR implementation. The research effectively answered the outlined questions and objectives by providing practical guidance for technical improvements and policy development needed to upgrade Kuwait's healthcare system through EHR implementation.

Implications and Recommendations

Government-led initiatives including financial incentives together with regulatory frameworks and strong data privacy protections are essential for successful Electronic Health Record (EHR) system adoption in Kuwait. Healthcare professionals and IT staff need custom training programs because they help bridge skill shortages and increase user confidence. A strategic implementation plan for Electronic Health Record (EHR) systems should be established by policymakers who begin with real-world pilot programs to refine and perfect these solutions. A sustainable digital health integration approach requires collaboration between healthcare providers, government bodies and technology experts. The proposed guidelines seek to develop Kuwait's healthcare system into one that achieves better efficiency and security while prioritizing patient needs.

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