

**The Impact of Digital Healthcare Technologies on
Patient Safety Culture**

-A Field Study in Private Hospitals in Amman, Jordan-

أثر تقنيات الرعاية الصحية الرقمية على ثقافة سلامة المرضى
- دراسة ميدانية في المستشفيات الخاصة في عمان، الأردن -

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**Thesis Submitted as Partial Fulfillment of the Requirements
for Master's Degree in Business Administration**

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June 2024

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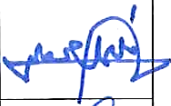
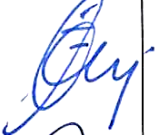
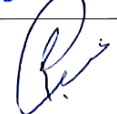
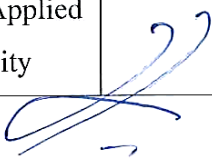
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Acknowledgments

I would like to express my deep gratitude and appreciation to the Middle East University, which provided me with the opportunity to complete my studies after facing obstacles in my academic path. The university has shown great generosity and hospitality towards me during this critical period, facilitating my access to the resources and educational opportunities that we needed.

I would like to extend special thanks to all the individuals who contributed to facilitating my academic journey, particularly, I would like to express my deep gratitude to Prof. Dr. Ahmed Ali Salih, Prof. Dr. Abdel-Aziz Al Sharabati, and Prof. Dr. Ahmed Al-Ghandour. Their dedication and continuous cooperation greatly contributed to facilitating and achieving this success.

I also extend my sincere thanks and appreciation to my supervisor Dr. Fayez Albadri, and all those who supported and assisted me throughout my academic journey at Middle East University.

The researcher

Reem Abd Al-Mohdi Al-Jarrah

Dedication

I would like to dedicate my success to my family and friends who have encouraged and supported me during my journey. I would also like to thank my mentors and loved ones for guiding, motivating, and understanding me. Their dedication has enabled this success, and I am eternally grateful for their constant support.

The researcher

Reem Abd Al-Mohdi Al-Jarrah

Table of Contents

Subject	Page
Title	i
Authorization	ii
Examination Committee’s Decision	iii
Acknowledgments	iv
Dedication	v
Table of Contents	vi
List of Tables	viii
List of Figures	ix
List of Appendice.....	x
Abstract in English.....	xi
Abstract in Arabic	xii
CHAPTER ONE: Study Background and Importance	1
1.1 Introduction.....	1
1.2 Study Goal and Objectives	3
1.3 Study Importance	3
1.4 Study problem.....	4
1.5 Study Questions	5
1.6 Study Hypothesis	6
1.7 Study Model.....	7
1.8 Operational Definition of Terms.....	8
1.9 Study Limitations.....	9
1.10 Study Delimitation.....	10
CHAPTER TWO: Theoretical Framework and Previous Studies	11
2.1 Theoretical Framework.....	11
2.1.1 Digital Healthcare Technologies	11
2.1.2 Patient Safety Culture.....	16
2.2 Previous Studies.....	20
2.3 What distinguishes the current study from previous studies?.....	35
CHAPTER THREE: Methodology (Procedure and Method).....	36
3.1 Study Approach	36
3.2 Study Population, Sampling, and Unit of Analysis	36
3.3 Data Sources	37
3.4 Hospital Survey on Patient Safety Culture Version 2.0.....	38
3.5 Validity and Reliability Test:.....	40

CHAPTER FOUR: Study Results and Hypotheses Test	49
4.1 Introduction.....	49
4.2 Data analysis	49
4.2.1 Descriptive analysis of study variables:	49
4.2.2 Relationship between Independent and Dependent Variables:	56
4.3 Hypothesis Testing	57
4.4 Multiple Linear Regressions	59
4.5 Main Hypothesis testing:	60
CHAPTER FIVE: Discussion, Conclusion, and Recommendations.....	65
5.1 Introduction.....	65
5.2 Discussion of descriptive analysis:	65
5.3 Discussion of the results related to the main hypotheses:	67
5.4 Discussion of the result of the study hypotheses:	68
5.5 Recommendation	70
5.6 Directions for future studies	72
References.....	73
Appendices.....	1

List of Tables

Ch. No – Figure No.	Table Content	Page
Table (3.1)	References for the development of the questionnaire paragraphs	42
Table (3.2)	Items' scoring based on five-level Likert scale	42
Table (3.3)	Patient Safety Culture dimensions and definitions	44
Table (3.4)	Principal Component Analysis for the Digital Health Technologies Characteristics	46
Table (3.5)	Principal Component Analysis for the Teamwork within units	47
Table (3.6)	Principal Component Analysis for the non-punitive response to error	48
Table (3.7)	Principal Component Analysis for the Learning & Continuous improvement	49
Table (3.8)	Principal Component Analysis for the Communication: Openness/ Error feedback	49
Table (3.9)	Principal Component Analysis for the Supervisor/manager expectations	50
Table (3.10)	Reliability Test	51
Table (3.11)	Demographic Data for the study sample	52
Table (4.1)	Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Level of Digital Health Technologies Characteristics'	55
Table (4.2)	Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Patient Safety Culture	57
Table (4.3)	Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Teamwork within units	57
Table (4.4)	Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Non-punitive response to error	58
Table (4.5)	Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Learning and Continuous improvement	59
Table (4.6)	Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Communication: Openness/ Error feedback	60
Table (4.7)	Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Supervisor/manager expectations	61
Table (4.8)	Relationship between the Variables of the study	61
Table (4.9)	Tolerance and Variance Inflation Factor	64
Table (4.10)	Multiple Linear Regressions dimensions of the Patient Safety Culture on Digital Health Technologies Characteristics.	64
Table (4.11)	Multiple Linear Regressions of the dimensions of the Patient Safety Culture on Digital Health Technologies Characteristics (ANOVA).	64

List of Figures

Ch. No – Figure No.	Content	Page
Figure (1.1)	Study Model	8
Figure (4.1)	Normality Test	62
Figure (4.2)	Linearity Test	63
Figure (4.3)	Equal variance	63

List of Appendice

No.	Contents
Appendix (1)	Referees Committee
Appendix (2)	Questionnaire
Appendix (3)	Facilitation Letter
Appendix (4)	MOH approval letter
Appendix (5)	Approval Letter
Appendix (6)	Approval Letter

The Impact of Digital Healthcare Technologies on Patient Safety Culture

-A Field Study in Private Hospitals in Amman, Jordan-

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Abstract

The study sought to determine the impact of digital healthcare technologies (DHT) on the culture of patient safety (PSC) in private hospitals in Amman, Jordan. The study focused on (PSC) dimensions such as teamwork, error response, continuous improvement, communication, and supervisors'/managers' expectations in fostering a patient-safe culture. The study used a quantitative, descriptive, cause-effect, and cross-sectional design and data collection methods, including a modified version of the Hospital Survey on Patient Safety Culture (HSOPSC). Data collection of 380 responses was obtained, the researcher used the statistical techniques; validity, reliability, normality test, and multiple regression tests to test the hypotheses.

The findings indicated that digital health technology had a significant influence at private hospitals in Amman, Jordan. Furthermore, digital health technology had a significant impact on patient safety culture across all five dimensions. The most highly rated patient safety culture factors were supervisor/manager expectations and Communication: Openness/Error feedback, while the lowest rated dimensions were non-punitive error response and Learning & Continuous improvement, both of which have significant room for improvement.

The study additionally offers several recommendations, such as prioritizing continuous development and patient safety culture training in private hospitals, emphasizing Digital Health Technologies by investing in advanced and user-friendly healthcare systems, and encouraging communication among team members, which will eventually lead to a strong safety culture and improve the overall healthcare system.

Keywords: Digital Health Technologies (DHT), Patient Safety Culture (PSC), Private Hospitals in Amman, Jordan.

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إعداد: ريم عبد المهدي الجراح

إشراف: الدكتور فايز البديري

الملخص

هدفت الدراسة إلى تحديد تأثير تقنيات الرعاية الصحية الرقمية (DHT) على ثقافة سلامة المرضى (PSC) في المستشفيات الخاصة في عمان، الأردن. ركزت الدراسة على أبعاد (PSC) مثل العمل الجماعي، والاستجابة للأخطاء، والتحسين المستمر، والتواصل، وتوقعات المشرفين / المديرين في تعزيز ثقافة سلامة المرضى. استخدمت الدراسة المنهج الكمي والوصفي والسببي والمستعرضة، وتم استخدام نسخة معدلة من استبانة المستشفى حول ثقافة سلامة المرضى (HSOPSC). تم الحصول على بيانات بلغت 380 إجابة، استخدم الباحث الأساليب الإحصائية؛ الصدق، والثبات، واختبار الحالة الطبيعية، واختبارات الانحدار المتعدد لاختبار الفرضيات.

أشارت النتائج إلى أن تكنولوجيا الصحة الرقمية لها تأثير كبير في المستشفيات الخاصة في عمان، الأردن. علاوة على ذلك، كان لتكنولوجيا الصحة الرقمية تأثير كبير على ثقافة سلامة المرضى عبر الأبعاد الخمسة. كانت عوامل ثقافة سلامة المرضى الأكثر تقييماً هي توقعات المشرف/المدير والتواصل: ردود الفعل على الانفتاح/الخطأ، في حين كانت الأبعاد الأقل تقييماً هي الاستجابة للأخطاء غير العقابية والتعلم والتحسين المستمر، وكلاهما لهما مجال كبير للتحسين.

بالإضافة إلى ذلك، تقدم الدراسة العديد من التوصيات، مثل إعطاء الأولوية للتطوير المستمر والتدريب على ثقافة سلامة المرضى في المستشفيات الخاصة، والتأكيد على تقنيات الصحة الرقمية من خلال الاستثمار في أنظمة الرعاية الصحية المتقدمة وسهولة الاستخدام، وتشجيع التواصل بين أعضاء الفريق، الأمر الذي سيؤدي في النهاية إلى مجتمع قوي. ثقافة السلامة وتحسين نظام الرعاية الصحية الشامل.

الكلمات المفتاحية: تقنيات الرعاية الصحية الرقمية، ثقافة سلامة المرضى، المستشفيات الخاصة في عمان، الأردن.

CHAPTER ONE

Study Background and Importance

1.1 Introduction

The healthcare industry is currently undergoing rapid technological advancements, which are revolutionizing various aspects of the healthcare field. These advancements hold great significance as they impact the enhancement of medical services for patients, cost reduction, and overall improvement in the patient experience. It is evident that technological advancements play an important role in reshaping the concept of healthcare and delivering improved healthcare services.

Digital Health Technologies (DHT) have transformed the way patient data and healthcare information are stored, analyzed, processed, and used, not only to inform organizations about the quality of healthcare services delivered and implemented (Senbekov et al., 2020). Technological innovations play a vital role in changing the notion of healthcare and providing better healthcare services, reducing medical errors, and increasing the efficiency of healthcare professionals (Azyabi et al., 2022). Patients' safety culture is an important factor in determining healthcare organizations' ability to address and eliminate risks to patients, as is the need to replace the conventional culture of shame and blame with a non-punitive culture (Khater et al., 2015), and the healthcare industry has witnessed significant transformations that have had an impact on the Patient Safety Culture (PSC), which serves as a crucial foundation for improving care quality and ensuring patient safety (Azyabi et al., 2022).

The increasing reliance on technology and its usage in healthcare systems has made it easier to integrate DHT into hospital environments and architecture (Sharma et al., 2020). The healthcare business has seen a variety of advances aimed at improving life expectancy, quality of life, diagnostic and treatment choices, as well as the healthcare

system's efficiency and cost-effectiveness (Vincent, 2010). This advancement in healthcare technology has expedited the revolution in healthcare service delivery, resulting in better patient outcomes and experiences. These healthcare technologies enable effective communication among healthcare providers, resulting in improved patient care and achievement of organizational goals (Alolayyan et al., 2020), which in turn has a significant impact on healthcare outcomes by allowing patients and doctors to collaborate more effectively and improve mutual satisfaction (Yellowlees et al., 2015).

Therefore, as a tangible component of the setting where healthcare is delivered, DHT must be critically examined within the perspectives of Patient Safety Culture (PSC), which is defined as the application of shared organizational values, beliefs, and competencies within the context of the work environment necessary to ensure healthcare safety, prevent harm or injury to patients, and enable organizations to meet their targets and standards in a cost-effective manner (Lee et al., 2019). PSC has many dimensions including, but not limited to, work pressure and pace, workforce and staffing, supervisor and management support for patient safety, teamwork, response to error, communication openness, communication about error, and organizational learning and continuous improvement (Waterson et al., 2019). Furthermore, PSC encompasses multiple organizational levels, from the system to its components of hospital, department, and individual units, emphasizing the broader implications of how patient safety is embedded in the culture of healthcare professionals as they navigate their roles within various healthcare delivery systems and processes (Berry et al., 2020).

In order to contribute in a broader understanding of the interplay between digital technologies and patient safety culture; therefore, there is a need to investigate the Impact of Digital Healthcare Technologies on Patient Safety Culture in Private Hospitals in Amman, Jordan.

1.2 Study Goal and Objectives

The primary goal of this research is to explore the impact of digital healthcare technology (DHT) utilization on patient safety culture (PSC) as perceived by healthcare professionals (nurses and medical staff) in private hospitals in Amman, Jordan. To achieve this, the following objectives have been developed:

- 1 To find the level of implementing digital health technology in private hospitals in Amman, Jordan.
- 2 To find the level of practising PSC in private hospital in Amman, Jordan
- 3 To test the relationship between DHT and PSC in private hospitals in Amman, Jordan?
- 4 To investigate the impact of DHT on the Patient Safety Culture (PSC) in private hospitals in Amman, Jordan?

1.3 Study Importance

The significance of this study as considered from both theoretical and practical points of view are as follows:

1.3.1 Theoretical Significance:

- Based on the researcher's review of previous studies, a relevant gap has been identified concerning the relationship between Digital Healthcare Technologies and the Patient Safety Culture in private hospitals in Amman, Jordan. This research aims to address this gap by exploring contemporary and relevant topics in knowledge-based economies, specifically the Digital Healthcare Technologies and the Patient Safety Culture.
- This study contributes to the advancement and deepening of academic research by developing reliable measures and variables that can be utilized to study the relationship between Digital Healthcare Technologies and the Patient Safety Culture of private hospitals in Amman, Jordan.

1.3.2 Practical Significance:

- Conducting a study on the impact of Digital Healthcare Technologies on the Patient Safety Culture in private hospitals in Amman, Jordan is a fundamental step that aims to improve the efficiency of private hospitals and make a positive contribution to the national economy. Recognizing the importance of the healthcare sector as a strategic and vital service sector in the Kingdom of Jordan.
- This study holds significant value on highlighting the importance of implementing Digital Healthcare Technologies in private hospitals in Amman, Jordan and identifying the specific areas of digital technologies that should be maximized and implemented for enhancing overall objectives and creating value for these hospitals.
- This study will also contribute to developing the Healthcare professionals competence in the use of DHT. Furthermore, medical management and hospital administrators can devise strategies for establishing the infrastructure and environmental context required to encourage DHT utilization.

1.4 Study problem

Based on the previous information and after the researcher conducted field visits and interviews with number of directors of private hospitals in Amman, and department heads and based on my experience in this field it appears that there is a need to conduct a comprehensive study to assess the extent of implementation of digital healthcare in the patient safety culture in private hospitals in Amman.

While Digital Health technologies have shown promise in improving patient care quality, efficiency, and safety, it is essential to evaluate its actual influence on these outcomes in a specific context. Therefore, there is a need for a systematic analysis and examination of Digital Health technologies implementation in Jordan Healthcare

providers, focusing on the patient safety culture as the key outcome achieved and the factors influencing its effectiveness, to enhance healthcare delivery and optimize patient care experience.

The scarcity of data shows a lack of evidence about the impact of digital healthcare technologies and patient safety culture in Jordanian healthcare settings. As a result, while DHT has demonstrated potential in enhancing patient care quality, efficiency, and safety, it is critical to assess its real impact on these outcomes in a specific setting. Similarly, little is known about PSC in Jordanian hospitals, especially among healthcare providers (Khater et al., 2015). Private hospitals in Amman, Jordan, require a systematic analysis and investigation of DHT implementation, with an emphasis on the PSC as the major objective attained and the factors determining its efficacy, in order to improve healthcare delivery and maximize patient care experiences.

Despite the innovative nature of digital health technologies, there is limited evidence regarding their direct influence on patient safety culture, whether positive or negative (Jiang et al., 2019). This knowledge gap extends to the perceptions of primary healthcare in Jordan regarding patient safety, as highlighted by Khamaiseh et al. (2020). While the Jordan Medical Association emphasizes the need to improve organizational culture for enhancing patient safety, it is crucial to explore whether the utilization of digital health technologies can contribute to this goal. Further research is required to investigate the potential impact of digital health technologies on patient safety culture within the context of healthcare settings in Jordan and other similar healthcare systems.

1.5 Study Questions

Based on the problem statement mentioned above, the study will obtain to address the following research questions:

1. What is the level of implementing Digital Health Technologies in private hospitals in Amman, Jordan?
2. What is the level of practising Patient Safety Culture in private hospital in Amman, Jordan?
3. Is there a relationship between Digital Health Technologies and Patient Safety Culture in private hospitals in Amman, Jordan?
4. Is there an impact of Digital Health Technologies on the Patient Safety Culture in private hospitals in Amman, Jordan?

The first and second research questions will be answered using descriptive statistics, the third research question will be answered using correlation analysis, and the fourth research question will be answered by hypothesis testing.

1.6 Study Hypothesis

The following hypotheses were established based on the aforementioned study problem and questions:

H01 – There is no impact of Digital Health Technologies Characteristics on the Patient Safety Culture (teamwork within units, non-punitive response to error, learning & continuous improvements, communication, and supervisor/ manager expectations) in Private Hospitals in Amman, Jordan by ($\alpha \geq 0.05$).

Based on the PSC dimensions, the main hypothesis can be divided into the following sub null Hypothesis:

H01.1 – There is no impact of Digital Health Technologies Characteristics on the Teamwork within units in Private Hospitals in Amman, Jordan by ($\alpha \geq 0.05$).

H01.2 – There is no impact of Digital Health Technologies Characteristics on the Non-punitive response to error in Private Hospitals in Amman, Jordan by ($\alpha \geq 0.05$).

H01.3 – There is no impact of Digital Health Technologies Characteristics on the Learning & Continuous improvement in Private Hospitals in Amman, Jordan by ($\alpha \geq 0.05$).

H01.4 – There is no impact of Digital Health Technologies Characteristics on the Communication; (Openness/ Error Feedback) in Private Hospitals in Amman, Jordan by ($\alpha \geq 0.05$).

H01.5 – There is no impact of Digital Health Technologies Characteristics on the Supervisor/Manager expectations in Private Hospitals in Amman, Jordan by ($\alpha \geq 0.05$).

1.7 Study Model

To meet the research purpose, the research model was created by investigating the relationship between the research variables.

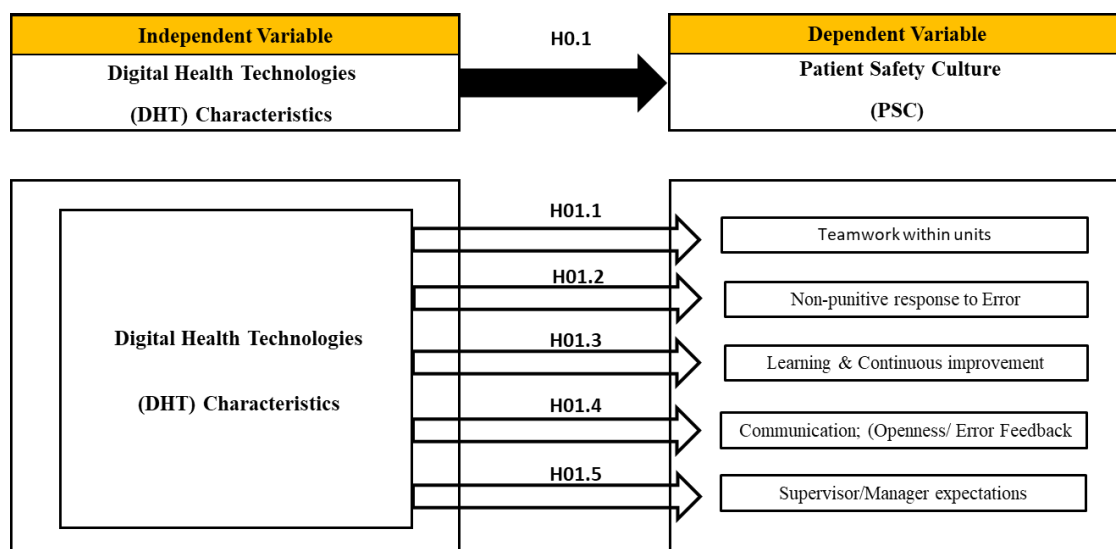


Figure (1.1): Study Model

Source: Prepared by the researcher based on the following: Independent: Nebeker et al (2019); Senbekov et al. (2020); Dependent: Reis et al., (2018); Sorra J, et al. (2016)

1.8 Operational Definition of Terms

Digital Health Technologies (DHT) – can be defined as the digital tools used in the healthcare domain that assist in the conversion of patient information into digital data to enhance various aspects of healthcare, such as patient care, diagnosis, treatment, communication, data management, and research.

The DHT can be identified through its main characteristics and is measured by the degree of response of the study sample to the paragraphs prepared for this purpose in the scale specified for through the questions (28,29,30,31,32,33,34,35,36,37,38,39,40, 41).

Patient Safety Culture (PSC) can be defined as a set of behaviours within the healthcare providers that determine the commitment to quality and safety in patient care.

The patient safety culture is divided into five main dimensions:

Teamwork within units occurs in a professional setting where staff members work collaboratively as a team, providing support and displaying mutual respect towards one another. They actively support and assist their colleagues while maintaining a respectful and cohesive work environment. It is measured by the degree of response of the study sample to the paragraphs prepared for this purpose in the scale specified for question numbers (1, 2, 3, 4, 5, 6).

Non-Punitive Response to error refers to an approach where staff members feel that their mistakes and event reports are not used against them, and that these errors are not permanently recorded in their professional record. It is measured by the degree of response of the study sample to the paragraphs prepared for this purpose in the scale specified for question numbers (7, 8, 9, 10, 11).

Learning & Continuous improvements involve an ongoing process where staff members acquire knowledge, develop skills, and make gradual enhancements to achieve improved outcomes and performance. Mistakes serve as catalysts for positive changes, and the effectiveness of these changes is evaluated as part of the process. It is measured by the degree of response of the study sample to the paragraphs prepared for this purpose in the scale specified for question numbers (12, 13, 14, 15, 16).

Communication refers to the process that encourages staff members to openly express their concerns and question authority when appropriate. It plays a vital role in ensuring that errors are effectively communicated, feedback is provided, and discussions take place to prevent future mistakes. Such communication fosters a collaborative and learning-oriented environment, promoting transparency, trust, and continuous improvement within the organization. It is measured by the degree of response of the study sample to the paragraphs prepared for this purpose in the scale specified for question numbers (17, 18, 19, 20, 21, 22).

Supervisor/ Manager Expectations refers to the behaviours and standards set by supervisors and managers within an organization to prioritize the safety of patients. This includes valuing staff suggestions, recognizing and praising staff members who follow safety procedures, and actively addressing patient safety issues. It is measured by the degree of response of the study sample to the paragraphs prepared for this purpose in the scale specified for question numbers (23, 24, 25, 26, 27).

1.9 Study Limitations

- Spatial: This study had applied at private hospital in Amman, is excluded At (Al Amal Hospital, Al Khalidi Hospital, Al Kindi Hospital, Arab Medical Centre, Islamic Hospital, Istklal Hospital, & Jordan Hospital).

- Human: The study focused on the viewpoints of healthcare professionals, including doctors, nurses, and other staff members.
- Temporal: The study conducted in the period of academic year 2023/2024.
- Patient Confidentiality: the study explored broader aspects of patient privacy, such as medication errors or surgical complications, which are not directly related to digital technologies.

1.10 Study Delimitation

- This study focused on the private hospital sector in Amman, Jordan and may not be applicable to other fields in Jordan. It excludes public hospitals and healthcare facilities in other parts of Jordan.
- The focus of the study was limited to the private sector, so caution should be used when applying the findings to the public sector.

CHAPTER TWO

Theoretical Framework and Previous Studies

This chapter aims to discuss in detail the important aspects encompassed by DHT utilization and its impact on the PSC through literature review, examining previous research to explore the impact of digital healthcare technology on patient safety culture.

2.1 Theoretical Framework

2.1.1 Digital Healthcare Technologies

Digital healthcare technology currently provides new and innovative approaches to improving patient safety, which is a critical and urgent requirement. These include the introduction of electronic health records and the use of various communication devices. These technologies have the potential to improve patient safety by optimizing processes, decreasing errors, enabling communication, and improving collaboration among healthcare personnel.

Digital healthcare technologies can take various forms. Vial, (2021) defined the Digital Healthcare Technology as a result of digital transformation, which is a "process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies. Kraus et al. (2020) found that DHT has infiltrated the complex healthcare ecosystem, which includes patients, healthcare providers, insurers, and regulators. DHTs enable healthcare providers to efficiently obtain supplies and resources, insurers to reimburse patients' medical costs, regulators to conform to policies. It involves the availability of information on healthcare systems, treatments, and complications, which when adopted, can improve the public's access and flexibility to healthcare (Senbekov et al. 2020). The DHT can be evaluated while usage in healthcare systems via the framework which

includes five domains: 1. Participant Privacy; 2. Risks and Benefits; 3. Accessibility and Usability; 4. Data Management and 5, Ethical Principles (Nebeker et al., 2019).

On the other hand, healthcare professionals are crucial in developing the infrastructures for DHT integration. This, in turn, enables physicians to prioritize patient values, preferences, and advocacy campaigns, collaborating with researchers, technology developers, societies, agencies, payers, and the industry to advance research priorities; Sharma et al. (2018) examined the role of DHT in supporting evidence-based practices. They organized a think tank conference to explore how DHT can enhance clinical research and care. The conference resulted in a framework where DHT is integrated into the clinical environment, emphasizing human interactions and utilization of available technology.

Ibrahim et al. (2022) conducted a systematic evaluation of the literature, but with an emphasis on how DHT affects evidence-based policies and practices for excellent healthcare. According to the authors, DHT has an impact on effectiveness, accessibility, patient safety, efficiency, patient-centered treatment, and equity. Using DHT enabled healthcare personnel to promote better health behavior, provide more accurate clinical assessments, assist patients in achieving treatment compliance, and improve healthcare service coordination. Similarly, to Jiang et al.'s (2019) assessment, mobile applications and computer-based programs were the most commonly used DHT by healthcare practitioners.

While DHT has been an emerging trend in recent years, its use increased significantly during the COVID-19 pandemic, when face-to-face contact was severely limited and DHT provided virtual solutions to support communication among healthcare professionals (Senbekov et al., 2020) conducted a review of the evidence regarding the

present applications and usage of DHT in a number of healthcare settings. The DHT has since expanded to include a variety of applications, including (1) 3D modeling, an AI-based platform, and E-libraries, (2) telemedicine and rural health, (3) patient and logistic data, (4) electronic health records, (5) next-generation sequencing and genomic studies, and (6) virtual clinical trials and research data (Senbekov et al., 2020).

Flott et al. (2021) conducted a review to better understand how DHT might help give safe patient care in healthcare settings. Their review revealed that DHT can influence patient safety by (1) helping build on success by providing blueprints for the delivery of safe and quality healthcare services; (2) ensuring involvement and inclusion by proactively involving individuals who would otherwise not have access to electronic and digital methods of communication and information handling; (3) identifying opportunities for innovation by utilizing a rigorous and data-driven strategy that allows prioritization of real-world issues and challenges; and (4) paving the way for a vision of the future where safe and quality delivery of healthcare becomes an organizational mission and vision. Flott et al. (2021) identified collaboration, openness, iterative change, proportionality, and inclusion as principles of applying DHT on patient safety.

Eriksson et al. (2022) conducted a qualitative study to investigate the role of DHT in the safe and effective implementation of primary healthcare consultations. Analysis of responses to semi-structured interviews revealed that DHT has (1) improved access by complementing already existing access points, enabling access that reduces anxiety and the need for further appointments, and promoting flexibility in communication methods, (2) promotes efficiency by developing confidence in the use of healthcare platforms and work processes, providing control over work situations, identifying gaps in the care received by patient groups, and streamlining ways with which patient get into contact

with healthcare services, and (3) promotes patient safety by improving ways of storing, handling and making use of patient and clinical information.

Tubaishat (2019) conducted another qualitative study to investigate the effects of electronic health records as DHT in enhancing patient safety in Jordanian hospitals. Semi-structured interviews revealed that DHTs in the form of electronic health records improved patient safety by reducing safety errors, improving data documentation, increasing data handling and storage sustainability, and ensuring data completeness and correctness. However, the findings revealed that DHT can have a detrimental impact on patient safety when there are incorrect data entry, technological issues, inadequate and reduced clinical warnings, and inefficient utilization of communication channels between systems and organizations.

Moreover, following the detrimental effects on patient safety when infrastructures and systems underlying DHTs fail, Martin et al. (2019) investigated patient safety occurrences over a 10-year period in hospitals in England and Wales. The results revealed that a total of 2,627 patient safety incidents were documented as a result of DHT failures, with up to 13% causing mild harm, 4% causing moderate harm, 1% causing severe harm, and less than 1% resulting in death. DHT failures included telecommunications breakdowns, failures in clinical assessment systems, incorrect, missing, or delayed relaying of test results due to system problems and issues, failure of systems to retain clinical documentation, and direct failure of equipment, hardware, software, and the human-technology interface. However, the authors emphasized that, while a large number of patient safety incidents were reported over the study period as a result of DHT failures, the majority of them were preventable (Martin et al., 2019).

Sittig et al. (2018) recognized the importance of DHTs in healthcare environments, but they also highlighted the concerns and challenges that can arise when employing DHTs to increase patient safety. After conducting a review of the literature, the authors identified key issues and challenges in using DHTs to promote patient safety, namely (1) challenges in design and development, including developing methods and tools to enable risk assessment, developing standard user interface design features and functions, ensuring software safety that is interfaced and networked with the clinical environment, and implementing methods that will allow accurate patient identification, (2) challenges in implementation, such as decision support systems and IT software, and (3) challenges in monitoring, evaluating, and optimizing existing DHT infrastructures, such as the use of real-time methods for system surveillance and auditing, cultural and legal frameworks for delivering DHT systems, and developing consumer-friendly models and methods. If obstacles are overcome, the authors believe DHT can be a valuable tool in assuring patient safety in many healthcare settings (Sittig et al., 2018).

Bates et al. (2021) conducted a scoping review to investigate how artificial intelligence, a type of DHT, could improve patient safety by reducing healthcare-associated infections, adverse drug events, venous thromboembolism, surgical complications, pressure ulcers, falls, patient deterioration, and diagnostic errors. Analyzing the findings of 392 studies revealed that DHT artificial intelligence applications pervaded several healthcare settings, including vital sign monitoring, wearables, pressure sensors, and computer vision, and that using such applications helped to prevent harm from occurring and reaching patients and other service users. Furthermore, the usage of DHT has been shown to drastically cut the economic expenditures of healthcare services while ensuring their safety and lack of harm (Bates et al., 2021).

In a similar line, Classen et al. (2018) investigated the impact of real-time analytics powered by DHT in facilitating patient safety monitoring and improvement in hospital settings. DHT was integrated into a patient safety active management system, allowing for a standardized review and clinical validation procedure, as well as the creation of a safety prediction score. Safety predictive scores processed by built-in DHTs enabled the detection of adverse events, and other complications.

2.1.2 Patient Safety Culture

Patient safety is defined as any preventable harm caused to a patient throughout their hospital stay or while receiving bad treatment at the facility. Patient safety culture has gained global attention for its impact on healthcare improvement by raising awareness and delivering evidence-based solutions.

Hospital patient safety culture is a multifaceted term that incorporates a broad and comprehensive view of the procedures, components, and tasks that protect patients from damage and injury while in hospital settings. Reis et al. (2018) conducted a systematic evaluation of the current evidence base in understanding the idea of hospital patient safety culture and its dimensions. The review found that PSC can be viewed across three dimensions: (1) unit-level dimensions, which include communication openness, feedback and communication about error, teamwork within units, non-punitive response to error, organizational learning and continuous improvement, supervisor and manager expectations and actions promoting patient safety, and staffing, (2) hospital-level dimensions, which include cross-unit teamwork, handoffs and transitions, and management support for patient safety; and (3) outcome dimensions, which include the frequency of reported occurrences and overall perceptions of patient safety (Reis et al., 2018). Furthermore, the analysis found that institutions with high prevalence of PSC had increased staff understanding of PSC and better patient outcomes.

In a similar line, Lee et al. (2019) conducted a systematic review to better understand the current evidence basis for PSC in hospital settings. The study's findings revealed that there was no one, uniform definition of PSC, and that in some circumstances, PSC was used interchangeably with the phrase "safety climate." There were only a few validated and reliable instruments for measuring PSC, including the Hospital Survey on Patient Safety Culture, the Safety Attitudes Questionnaire, the Patient Safety Climate in Healthcare Organizations, the Safety Organizing Scale, and the Vienna Safety Climate Questionnaire. Furthermore, according to the study PSC was found to be significantly associated with better patient outcomes such as fewer medication errors, higher patient satisfaction, fewer urinary tract infections, fewer pressure injuries, fewer falls, lower mortality rates, and shorter hospital stays.

Furthermore, Okuyama et al. (2018) conducted a comprehensive review and meta-analysis of research that examined levels of overall PSC and its domains across a wide range of healthcare settings globally. The review includes 59 studies: 29 from Asia, 18 from Europe, and 11 from the United States. According to the meta-analysis of the results, the domains of PSC with the most negative responses were management support for patient safety, feedback and communication about errors, communication openness, frequency of events reported, teamwork across units, staffing, handoffs and transitions, non-punitive responses to errors, and overall perceptions of patient safety. Only teamwork among units, supervisor and management expectations and actions to promote patient safety, and organizational learning and continuous development received favorable feedback.

Mansour and Sharour (2021) conducted a descriptive, cross-sectional study to investigate the characteristics that may influence the patient safety culture of nurses

working in emergency departments of governmental and public hospitals in Jordan. The findings revealed that younger nurses, nurses with lower burnout levels, and nurses with lower intention to leave had higher scores on patient safety culture. However, no correlation was discovered between job satisfaction, workload, and patient safety culture. Furthermore, there was no investigation into the relationship between DHT and patient safety culture.

Alshyyab et al. (2022) used a qualitative research methodology to investigate the elements that influence the patient safety culture of healthcare personnel in a Jordanian teaching hospital's operating room department. The analysis of responses from 33 semi-structured interviews revealed that operational, organizational, healthcare professional, and patient-specific factors influenced patient safety culture perceptions. The authors discovered that healthcare professionals could achieve higher levels of patient safety culture when the physical working environment was in good condition, innovative techniques were implemented, new surgical equipment was used, and hospital managers were supportive.

Malak et al. (2022) conducted a cross-sectional study to investigate the PSC of emergency room nurses in Jordan's governmental and private hospitals. A total of 424 nurses took part in the study. The findings revealed that participants exhibited moderate levels of PSC, indicating a need for improvement. The highest-scoring PSC domains were unit collaboration, error feedback and communication, and organizational learning. On the other hand, the domains with the lowest scores were frequency of occurrences reported and handoffs and transitions. PSC was substantially linked with participants' wealth and educational level.

Oweidat et al. (2023) measured PSC levels among nurses working in Jordan's governmental and private hospitals, as well as the association between PSC and intention to leave. A total of 220 nurses took part in the study. The findings revealed that just about half of the participants received a positive score for patient safety. Contrary to the findings of Malak et al. (2022), the highest-scoring PSC domains were teamwork, handoffs, and information exchange, whereas the lowest-scoring domains were staffing, workspace, and error response. Correlation studies revealed that nurses with high levels of PSC had significantly lower intentions to leave, despite the fact that the majority of participants expressed strong intentions to leave their current professions (Oweidat et al., 2023).

Alolayyan et al. (2023) used a sample of pharmacists working in Jordanian healthcare settings to investigate the association between PSC and patient satisfaction. The authors recruited matched cohorts of 204 pharmacists and pharmacy technicians, as well as 204 patients, and discovered significant relationships between job performance and PSC, job performance and patient satisfaction, and PSC and patient satisfaction mediated by job performance. Abu Assab et al. (2022) investigated levels of PSC among pharmacists working in community settings and discovered that the domains of PSC with the highest scores were teamwork, patient counselling, and staff training and skills, while the domains with the lowest scores were communication about mistakes, responses to mistakes, and organizational learning and continuous improvement.

In another vein, Mrayyan (2022) sought to uncover the determinants and outcomes linked with PSC. The author conducted a cross-sectional study with 300 nurses working in hospital settings in Jordan. The results indicated that participants had moderate levels of PSC. The highest-scoring PSC domains were non-punitive error replies and unit collaboration. The lowest-scoring domains were supervisor and manager expectations

and actions to promote safety and communication openness. The predictors of PSC were gender, organizational learning and continuous improvement, hospital handoffs and transitions, years of experience working at the current hospital, supervisor and manager expectations, and safety-promoting behaviors. Furthermore, nurses with high levels of PSC were found to have reported nil or few adverse events that affected patient outcomes (Mrayyan, 2022).

In contrast, Amarneh and Al Nobani (2022) evaluated the levels of PSC within multidisciplinary teams in Jordanian healthcare settings, as well as the function of collaboration among healthcare professionals in promoting PSC levels. The study enrolled 292 nurses, 201 physicians, and 32 nurse managers. The results showed that the individuals had high PSC scores. The highest scoring categories of PSC were supervisor and manager expectations and actions encouraging patient safety, as well as organizational learning and continuous development, while the lowest scoring domains were communication openness, handoffs and transitions, and staffing. Nurses and doctors who reported high levels of teamwork had higher PSC ratings (Amarneh & Al Nobani, 2022).

2.2 Previous Studies

1. Khater, et al. (2015) study entitled: **“Nurses' perceptions of patient safety culture in Jordanian hospitals”**.

This study aimed to assess patient safety culture in Jordanian hospitals from the perspective of nurses. A total of 658 nurses participated in the cross-sectional study, and data were collected using a survey. The findings indicated that teamwork within units was perceived as a strength in Jordanian hospitals, while areas such as communication openness, staffing, handoff and transition, non-punitive responses to errors, and teamwork across units required improvement. Regression analysis identified factors that

influenced patient safety culture, including age, years of experience, working in university hospitals, utilizing evidence-based practice, and working in hospitals prioritizing patient safety. The study recognized the limitations of focusing solely on nurses and using self-reported questionnaires, suggesting the need for perspectives from other healthcare providers and addressing social desirability biases. The study emphasized the importance of replacing the traditional blame culture with a non-punitive approach and highlighted the need for policy changes to improve collaboration between hospital units for enhanced patient safety culture.

2. Elmontsri, et al. (2017) study entitled: **“Status of patient safety culture in Arab countries: a systematic review”**.

A systematic review examined the patient safety culture in Arab countries using the Hospital Survey on Patient Safety Culture (HSPSC). The review included 18 studies and found that a non-punitive response to error was a significant issue that needed improvement. Healthcare professionals in Arab countries believed that a "culture of blame" hindered incident reporting. Teamwork within units was generally better than teamwork across hospital units. Organizational learning and continuous improvement were reported as satisfactory. However, communication openness was identified as a concerning issue. The review concluded that promoting patient safety culture is essential for improving patient safety in the Arab world and should involve various stakeholders. It is important to consider language limitations and the influence of different healthcare settings on perceptions of safety culture.

3. Abousallah. (2018) Entitled study: **“The Impact of Application of International Safety Goals on Patient Safety Culture: A Field Study In Private Hospitals That Working in the City Of Amman”**.

The study aimed to investigate the impact of International Patient Safety Goals on Private Jordanian Hospitals from the perspective of the medical staff. The research

employed a descriptive and analytical method, focusing on Private Jordanian Hospitals with Joint Commission International Accreditation for patient safety. Data was collected through questionnaires distributed among the medical staff in these hospitals, with a sample size of 156 participants. The questionnaire was based on the Agency of Healthcare Research & Quality and refined through a literature review and panel of referees committee. Descriptive statistics were obtained using the Statistical Package for Social Science (SPSS ver.16), and statistical techniques such as correlation and simple regressions were employed to test the hypotheses. The results indicated a consensus on the high implementation of International Patient Safety Goals in Private Jordanian Hospitals. Furthermore, a strong relationship was observed between the overall International Patient Safety Goals and Patient Safety Culture. All variables of International Patient Safety Goals influenced the Patient Safety Culture in Private Jordanian Hospitals. Based on the findings, the study recommends focusing on enhancing all elements of International Patient Safety Goals collectively, as they are interconnected and positively impact various aspects of patient safety culture at different levels.

4. Lawati, et al. (2018) study entitled: **“Patient safety and safety culture in primary health care: a systematic review”**.

This study aimed to review the existing literature on safety culture and patient safety measures in primary care globally, with a specific focus on the Middle East, particularly in the Gulf Cooperation Council (GCC) countries. The goal was to gather information that would inform the development of safety culture among healthcare workers in primary care, specifically in the Sultanate of Oman. They used search terms related to safety culture, patient safety, and primary care. Out of the 3,072 papers identified in the initial search, 28 papers met the inclusion criteria and were included in the review. The included studies were distributed globally, with a majority from the Netherlands, the United States, Germany, and the United Kingdom. There were also studies from Australia, Canada,

Brazil, Turkey, Iran, Saudi Arabia, and Kuwait. The themes identified in the studies included safety culture in primary care, incident reporting, safety climate, and adverse events. The Hospital Survey on Patient Safety Culture (HSOPSC) was identified as the most used assessment tool for safety culture in primary care, particularly in countries in the Middle East such as Kuwait, Turkey, and Iran. Based on the findings of the systematic review, the authors concluded that the initial step in developing safety culture in primary care is to assess the existing safety culture. They highlighted the importance of using tools like the HSOPSC to gain a basic understanding of healthcare providers' perceptions related to safety. Regular assessment of safety culture in primary care was recommended to evaluate the effectiveness of safety measures in healthcare institutions.

5. Reis et al. (2018) study entitled: **“The patient safety culture: a systematic review by characteristics of Hospital Survey on Patient Safety Culture dimensions”**.

The study employed the Web of Science and Scopus to search from 2005 to July 2016 in English, Portuguese, and Spanish, resulting in 33 papers covering 21 nations. The researchers employed the Hospital Survey on Patient Safety Culture to assess safety culture in hospital organizations, which was effective and appropriate to the study's diverse aims. The study's findings revealed a predominance of hospital organisational cultures that were underdeveloped or inadequate in terms of patient safety, and the researchers' recommendations for safety culture evaluation should be linked to measures meant to develop safety culture throughout the hospital. As a result, this study provides useful insights on the significance of safety culture assessment and the necessity for comprehensive methods to its development.

6. Songur, et al, (2018) study entitled: **“Patient safety culture, evidence-based practice and performance in nursing”**.

This cross-sectional study aimed to investigate the impact of nurses' perceptions of patient safety culture and their evidence-based nursing attitudes on the patient safety level

and employee performance in a state hospital in Burdur, Turkey. The study included 218 nurses who participated in face-to-face interviews.

The results of the analysis indicated that the dimensions of evidence-based nursing attitudes and hospital safety culture explained 29.2% of the total variance in the hospital's patient safety level. Additionally, evidence-based nursing attitudes and hospital safety culture dimensions explained 15.5% of the total variance in nurse performance. Among the specific aspects of these dimensions, the "evidence-based nursing related beliefs and expectations" aspect of evidence-based nursing attitudes and the "management support for patient safety" aspect of patient safety culture were significant predictors of nurses' performance. These findings contribute to the growing interest in enhancing evidence-based practice and service quality to achieve improved patient outcomes. The study highlighted the importance of nurses' attitudes towards evidence-based nursing and the support provided by management for patient safety in influencing both patient safety levels and nurse performance.

7. Campione, et al. (2019) study entitled: **“Patient Safety Culture, Health Information Technology Implementation, and Medical Office Problems That Could Lead to Diagnostic Error”**.

This study sought to investigate the association between patient safety culture, health information technology (IT) adoption, and the prevalence of problems that could lead to diagnostic errors in medical offices. The researchers collected survey data from 925 medical offices and developed a multivariate regression model to quantify the impact of culture on problem frequency while controlling for health IT implementation, office characteristics, and survey variables. The most commonly mentioned issue was the absence of lab or imaging test findings when needed. The study discovered that higher overall culture scores were linked to less incidences of each assessed concern. Offices

that were in the midst of implementing health IT experienced more challenges than those that had completed the implementation. This study shed light on how patient safety culture and health IT adoption can influence failures in care procedures, thereby increasing diagnostic errors.

8. Alsabaani, et al, (2020) study entitled: **“Perceptions of patient safety culture among physicians and nurses in a tertiary hospital in southwestern Saudi Arabia”**:.

This cross-sectional study aimed to explore the attitudes and perceptions of physicians and nurses towards patient safety culture in a tertiary hospital in southwestern Saudi Arabia. A self-administered questionnaire developed by the Agency for Healthcare Research and Quality was used to collect data from a representative sample of physicians and nurses. The study included 369 participants, with a majority of females (70.7%). The overall patient safety grade received a mean score of 72.3, indicating a relatively positive perception of patient safety. The dimensions of patient safety culture that received the highest ratings (scores over 70%) were "teamwork within units," "organizational learning-continuous improvement," and "feedback and communication about errors." However, the dimensions of "non-punitive responses to errors" and "staffing" received the lowest scores (less than 50%). Nurses had higher scores in both unit-level and hospital-level safety culture compared to physicians. Nurses' overall perceptions of patient safety were significantly better than those of physicians. The study concluded that while perceptions of "teamwork within units" and "organizational learning-continuous improvement" were positive among healthcare providers, there is room for improvement in other dimensions of patient safety culture. Nurses demonstrated better perceptions overall compared to physicians. Capacity-building programs should prioritize improving patient safety culture among healthcare providers, with a specific focus on physicians, to enhance healthcare delivery in the region. Further studies are recommended to evaluate

patient safety culture among healthcare workers at different levels of healthcare in the region, including primary and secondary levels.

9. ALFadhlah, et al, (2021) study entitled: **“Baseline assessment of patient safety culture in primary care centres in Kuwait: a national cross-sectional study”**.

This cross-sectional study assessed patient safety culture in Primary Health Care Centres in Kuwait and compared the findings to regional and international results. The study examined the predictors and outcomes of patient safety culture in these settings. Data from 6602 employees in 94 centres were analyzed using various statistical tests and regression analysis. The study revealed strengths in Teamwork and Organizational Learning, while areas needing improvement included Communication about Error, Overall Perceptions of Patient Safety and Quality, Communication Openness, Leadership Support for Patient Safety, and Work Pressure and Pace. Benchmarking analysis showed that Kuwait centres performed at benchmark levels or better compared to international and regional findings. The study emphasized the importance of improving patient safety culture in Primary Health Care Centres to enhance the quality and safety of healthcare services. The findings can guide country-level strategies in developing patient safety practices and governance. The study's evaluation against benchmarks is expected to help healthcare leaders in Kuwait set realistic targets for improvement. Overall, the results of this study should inform national strategies aimed at enhancing patient safety governance and practices in Primary Health Care Centres.

10. Titi, et al, (2021). study entitled: **“Staying ahead of the curve: Navigating changes and maintaining gains in patient safety culture-a mixed-methods study”**.

This study aimed to analyze changes in the results of the Hospital Survey on Patient Safety Culture (HSOPSC) between 2012 and 2019 in a tertiary care teaching multisite hospital in Riyadh, Saudi Arabia. The study also aimed to identify organizational factors

influencing these changes. The research utilized a combination of quantitative surveys and qualitative interviews with hospital staff and leadership. A total of 1,000 hospital staff members participated in the survey, and 31 executive board members and directors, as well as four focus groups of frontline workers, were qualitatively interviewed. The primary outcome measures included assessing 12 dimensions of patient safety culture as perceived by healthcare professionals. Additionally, semi-structured interviews were conducted to identify organizational factors, changes, and barriers impacting patient safety culture, along with suggestions for improvement. The comparative analysis of survey results indicated an overall positive trend in scores from 2012 to 2019. Areas of strength included teamwork, organizational learning, managerial support, overall perception of safety, and feedback and communication about errors. The lowest-scoring composites consistently included non-punitive response to error, staffing, and communication and openness. The qualitative interviews revealed that organizational changes may have influenced participants' responses to certain survey composites. In conclusion, patient safety culture is a dynamic concept that requires ongoing improvement efforts. Effective quality improvement initiatives can lead to noticeable changes in the patient safety culture within a hospital, and consistent commitment and support from leadership are essential for sustaining these improvements.

11. Najafi, et al. (2021) study entitled: **“The Effects of E-Learning on Patient Safety Culture in Emergency Nurses”**.

The study sought to assess the impact of e-learning on patient safety culture among emergency nurses and nursing managers. A quasi-experimental approach was used in the investigation, including non-randomized pre-test and post-test conditions. The participants comprised 69 emergency department nurses and 20 nursing managers from two hospitals in Qazvin, Iran. The participants were divided into two groups: one group

received standard patient safety lectures, and the other took a 15-part online e-learning course on patient safety. The patient safety culture was evaluated before and three months after the intervention using the Hospital Survey on Patient Safety Culture (HSOPSC) questionnaire. The data were examined using statistical tests such as the Chi-squared test, Fisher's exact test, t-tests, and Analysis of Covariance (ANCOVA). In August 2022. The study result found no significant effects of e-learning on the dimensions of PS culture related to incident reporting. However, e-learning was found to be more effective in improving PS culture among emergency room nurses compared to traditional lecture formats. It offers advantages such as cost-effectiveness, accessibility, and flexibility in providing in-service training. E-learning can be particularly useful during epidemics and pandemics, as it allows training without physical presence. Nursing managers and supervisors should focus on improving nurses' understanding of error reporting and creating a supportive environment to encourage reporting.

12. Opoku-Agyemang (2021) study entitled: **“Patient Safety and Health Information Technology Conceptual Framework”**.

The study provided an overview of the use of electronic health records in Canada, as well as a conceptual framework for integrating patient safety and technology. It used the example of metal hypersensitivity, a medical device-related adverse event, to demonstrate how health information technology (HIT) may assist build a learning health system and increase patient safety. The researcher developed a specific, quantitative, and tiered conceptual framework called the Patient Safety and Technology (PaSTech) framework, which guides the design of HIT for patient safety. The PaSTech framework addresses patient safety concerns in several areas, including safety culture, patient involvement/engagement, data protection, and patient portals. Implementing appropriate technology can increase efficiency, improve quality and safety, and save costs. When

properly used, technology improves clinician communication, pharmaceutical and medical device safety, error reduction, access to medical information, and patient-centered care. The results showed that the pre-test mean score for patient safety culture was significantly lower in the e-learning group compared to the comparison group. However, both groups had significant improvements in patient safety culture scores after the intervention. Furthermore, the e-learning group had a significantly higher post-test mean score for patient safety culture than the comparison group. Based on these findings, the study concludes that e-learning beats traditional lectures in improving the patient safety culture among emergency nurses. The researcher suggested that e-learning be tested as a viable technique for enhancing patient safety culture in emergency nursing facilities. This study presents a clear, quantitative, and multifaceted strategy to designing the current investigation.

13. Draganović & Offermanns (2022) study entitled: **“Patient safety culture in Austria and recommendations of evidence-based instruments for improving patient safety”**.

The purpose of this study was to analyze the patient safety culture in Austria, identify elements that contribute to greater levels of patient safety, and make evidence-based recommendations for enhancing patient safety culture in hospitals. The study used a cross-sectional design, including 1,525 participants from ten Austrian institutions. The researchers investigated the correlation between ten patient safety culture components, three background characteristics, and three patient safety-related outcome variables. They also did a variance analysis to assess how different professional groups in hospitals perceive patient safety culture. The findings showed that there is tremendous space for improvement in all ten patient safety culture characteristics. The most highly rated elements were communication openness and supervisor/manager's expectations and actions encouraging safety, whereas the lowest-ranked component was non-punitive error

response. The study also found that nurses, doctors, and other professional groups have quite different perceptions of patient safety culture. Based on these findings, the study indicates that the patient safety culture in Austria has room for development, and the identified patient safety culture elements are important in guaranteeing patient safety. The study presented evidence-based recommendations to improve each of the patient safety aspects.

14. Malak, et al., (2022) entitled study: **“Perceptions of patient safety culture among emergency room nurses in Jordanian accredited hospitals”**.

The study aimed to evaluate the perceptions of patient safety culture among emergency room nurses in Jordan. The background highlighted the importance of patient safety culture in healthcare institutions and the lack of studies in this area, particularly in Jordan and other Arab countries. The study utilized a cross-sectional design and included 424 emergency room nurses working in both government and private sectors in Jordan. The results indicated that the overall perception mean of patient safety culture was 70.6%, suggesting the need for improvement. Three areas related to patient safety culture were identified as strong: teamwork within units, feedback and communication about errors, and organizational learning-continuous improvement. On the other hand, the lowest scores were observed in the areas of frequency of events reported and handoffs and transitions. The study also found correlations between patient safety culture and factors such as income, educational level, and the principle of patient safety. In conclusion, the study emphasized the importance of regular assessments in emergency rooms to identify areas that require improvement and to promote a culture of patient safety. These assessments can provide valuable information to hospital managers for enhancing patient safety practices.

15. Selna, et al., (2022) study entitled: **“Association Between Electronic Health Record System and Patient Safety Culture In Hospitals Of Maldives: Nurses Perception”**.

The study aimed to assess nurses' perception of Electronic Health Record Systems (EHRs) and their effectiveness for Patient Safety Culture (PSC) in hospitals in Maldives. A cross-sectional study was conducted, and 292 nurses participated through simple random sampling. The findings indicated a relationship between EHR systems and PSC, with a slightly positive correlation. Linear regression analysis showed statistically significant values, suggesting the impact of EHR systems on PSC. However, existing EHR systems need evaluation to improve patient safety, including electronic error reporting, alerts, and reducing paperwork. Nurses perceived EHRs as useful but emphasized the need for user-friendly systems to maximize their usage for patient safety and quality care. The study provides a basis for future research on existing EHR systems, emphasizing the importance of incorporating patient safety alerts and minimizing the workload of healthcare providers, particularly nurses in Maldives. The study highlights the necessity of understanding the crucial role of EHRs in patient safety and quality care and implementing policies, regulations, and trainings to improve perception and promote EHR adoption. Assessing knowledge and attitude towards EHR use among healthcare providers, especially nurses, can help minimize adverse events and facilitate technology's contribution to reducing harm.

16. Dijkman, et al., (2023) entitled study: **“Assessment Tools for Measuring Health Literacy and Digital Health Literacy in a Hospital Setting”**.

The study emphasized the necessity of assessing (digital) health literacy in hospitals because it can increase staff understanding and allow for personalized communication, ultimately leading to better health outcomes. The ideal evaluation methods encompassed numerous dimensions of health literacy, were appropriate for the complexity of hospital

settings, and required a minimal administration time for routine usage. The research conducted an extensive search of numerous databases, yielding 251 papers that used 44 different assessment tools. 'understanding' was the most frequently addressed domain (98%), followed by 'access' (52%), 'apply' (50%), 'appraise' (32%), 'numeracy' (18%), and 'digital' (18%). This review aided health practitioners in choosing an assessment instrument that is practical for daily use and measures the relevant domains of (digital) health literacy.

17. Moosavi, et al. (2023) study entitled: **“The relationship between patient safety culture and adverse events in Iranian hospitals: a survey among 360 nurses”**.

This descriptive-analytical study conducted in Qazvin, Iran, aimed to investigate the patient safety culture, frequency of adverse events, and their relationship within hospitals. The study included nurses working in six hospitals, and data were collected through a patient safety culture questionnaire and an adverse event checklist. A total of 360 nurses completed the questionnaires, and multiple logistic regression was used for analysis. The results indicated that the highest mean score for patient safety culture was observed in the organizational learning dimension and feedback and communication about errors. On the other hand, the dimensions of information exchange and transfer and management support for patient safety received the lowest scores. The study found that management support for patient safety, general understanding of patient safety culture, teamwork, communication and feedback on errors, staff issues, and information exchange and transfer were significant predictors of adverse events. The study concluded that patient safety culture is a crucial predictor of adverse events. Healthcare managers should focus on improving patient safety culture and reducing adverse events by encouraging adverse event reporting and providing training courses for nurses. The study highlighted the importance of factors such as management support, understanding of patient safety

culture, and effective communication in reducing adverse events. The findings reinforced previous studies and emphasized the need for interventions promoting patient safety culture to minimize adverse events. Further research is recommended to validate these findings in other settings and identify specific interventions that can effectively enhance patient safety culture and reduce adverse events.

18. Veljanovska & Borota (2023) study intitled: **“Building a Strong Safety Culture: Reducing Errors in Healthcare Organizations”**.

The study demonstrated the value of error reduction in healthcare organizations in order to foster a strong safety culture and improve patient outcomes. It emphasizes the advantages of pursuing error-reduction measures, such as improving patient safety, increasing trust, encouraging continuous learning, and supporting quality improvement. The study also identified the safety culture main variables contributing to healthcare errors, including miscommunications, weariness, inadequate training, equipment failures, and system vulnerabilities. Learning from mistakes through error reporting and analysis is critical for discovering system issues and performing corrective actions. By viewing failures as opportunities to learn and develop, healthcare organizations may constantly improve their systems and procedures, ultimately benefitting patient safety and care delivery. Error reduction activities are also aligned with continuous quality improvement, allowing companies to improve training programs, implement process modifications, create new protocols, and address root causes of errors in order to provide high-quality treatment and improve patient outcomes.

19. Rida, P (2024) study intitled: **“Implementation of Electronic Medical Records (ERm) in Hospital Services”**.

The study evaluates the application of Electronic Medical Records (e-RM) in hospital services, highlighting its advantages over paper-based records in terms of speed,

accuracy, and quality. Through a review of literature on Indonesian regulations and standards, and an analysis of e-RM implementation in hospitals, the study finds that e-RM positively impacts hospital services by improving administrative processes, patient information access, and clinical decision-making, resulting in time and cost efficiency and reduced patient errors. It underscores the importance of legal compliance to ensure data security, confidentiality, and integrity. The study recommends continuous evaluation and updating of e-RM systems in hospitals to maintain efficient and integrated healthcare services, highlighting the need for periodic system renewals to prevent network delays.

20. Yayehrad, et al, (2024) study entitled: **“Patient safety culture and associated factors of regional public hospitals in Addis Ababa”**.

A cross-sectional study conducted in 2023, surveyed 494 randomly selected healthcare professionals using a structured questionnaire. Data analysis through binary logistic regression identified variables with p-values ≤ 0.05 as statistically significant, and model adequacy was verified using the Hosmer and Lemeshow goodness of fit test. The study found that 48.8% of participants had a good patient safety culture (95% CI: 44.3–53.1) with a 93.3% response rate. Significant factors associated with patient safety culture included having 6–10 years of experience (AOR = 1.81, 95% CI = 1.13–2.88), more than 11 years of experience (AOR = 3.49, 95% CI = 1.27–9.56), reporting adverse events (AOR = 2.47, 95% CI = 1.37–4.45), participating in patient safety programs (AOR = 3.64, 95% CI = 1.91–6.92), and working in obstetrics (AOR = 0.47, 95% CI = 0.23–0.94) and pediatric wards (AOR = 0.21, 95% CI = 0.097–0.44). The conclusion drawn was that the overall level of good patient safety culture in regional public hospitals was low (< 75%). Key factors significantly influencing patient safety culture were identified as years of experience, adverse event reporting, participation in patient safety programs, and working in specific wards like obstetrics and pediatrics.

2.3 What distinguishes the current study from previous studies?

The study of the DHT and its impact on the PSC and its dimensions (Teamwork within units, Non-Punitive response to errors, Learning & Continuous improvement, Communication, and Supervisor expectations) in private hospitals in Amman, Jordan, which is not commonly applied by researchers, providing unique insights into the issues and opportunities associated with patient safety culture in this specific geographic context.

Moreover, the current study bridges the gap in existing literature by investigating the relationship between DHT and patient safety culture, which has been relatively understudied. By exploring this direct relationship, the study contributes to filling the knowledge gap and expanding our understanding of how DHT influences patient safety culture outcomes.

CHAPTER THREE

Methodology (Procedure and Method)

This chapter describes the research method, research population, and sample selection. It also discusses the study model, research tools, the statistical analyses, and the validity and reliability of the study tools.

3.1 Study Approach

The study used analytical quantitative, descriptive, cause-effect, and cross-sectional approach through questionnaires to investigate the DHT effect on the of PSC and its dimensions in private hospitals in Amman, Jordan. The approach used was via survey questionnaires to gather the data and measure the major variables of interest (Polit and Beck, 2010).

The questionnaire generated based on theoretical literature from prior studies and scales created by other researchers, suited to the specific setting of private hospitals in Amman.

3.2 Study Population, Sampling, and Unit of Analysis

According to the Jordanian Ministry of Health, the research population includes all private hospitals in Amman, Jordan, which totals 47 as shown in Appendix (3). The investigation was conducted in pre-selected hospitals in Amman, capital city of Jordan. Seven private hospitals were chosen for the study, namely: Al Amal Hospital, Al Khalidi Hospital, Al Kindi Hospital, Arab Medical Centre, Islamic Hospital, Istklal Hospital, & Jordan Hospital.

These hospitals were chosen for the study because they meet the specific requirements of the research which are:

- (1) They provide high level services that are dependent on DHT.
- (2) They provide healthcare services to a wide range of populations with a variety of diseases and complex medical management.
- (3) They employ a diverse but inclusive healthcare workforce made up of different healthcare professionals.

These hospitals were chosen using convenience sampling. Considering the limited population size, the research sample was treated as the research population. A comprehensive survey approach was employed, and a total of 380 questionnaires were completed by healthcare professionals in these hospitals.

The unit of analysis includes all healthcare professionals.

3.3 Data Sources

Data sources for this study can be categorized into two types:

- A) Secondary data: This includes information and data gathered from the Ministry of Health, as well as exchanges with private hospitals in Amman, Jordan. It also includes material from books, research papers, and specialized scientific publications about the research topic.
- B) Primary data: This refers to the data and information gathered during the field study, typically via the research tool "questionnaire." The questionnaire was used to collect information directly from participants during the research procedure.

Study Instrument (Questionnaire)

As questionnaire is one of the most important data collection tools in most analytical studies (Neuman, 2014). A questionnaire was developed based on previous studies, and the data will be collected from participants, The questionnaire developed and tailored based on the literature listed in Table (3-1).

Table (3.1) References for the development of the questionnaire paragraphs

Variables	Resources
Patient Safety Culture (PSC)	Sorra J, et al. (2016)
Patient Safety Culture (PSC) Dimensions: <ul style="list-style-type: none"> – Teamwork within units – Non-Punitive response to errors – Learning & continuous improvement – Communication – Supervisor/ Manager expectations 	Sorra J, et al. (2016)
Digital Health Technologies Characteristics (DHT)	Nebeker et al. (2019) Senbekov et al. (2020)

Each item in the questionnaire was awarded a score to determine the amount of agreement among study participants on statements about the variables in the study model according to the five-level Likert scale, as shown in table (3-2) below:

Table (3.2) Items' scoring based on five-level Likert scale.

Response	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Level	1	2	3	4	5

3.4 Hospital Survey on Patient Safety Culture Version 2.0

PSC will be measured using the Agency for Healthcare Research and Quality's Hospital Survey on PSC Version 2.0 (HSOPS) (2021) (Reis et al., 2018). The tool consists of 40 items and measures the dimensions of PSC: staffing, collective perceptions of safety, cooperation within hospital units, teamwork across units, Organizational learning and continuous improvement, supervisor/manager expectations and safety promotion, management support for patient safety, communication openness, feedback and communication regarding error, frequency of reporting events, non-punitive responses to error, and hands-off and transitions. The higher the score, the more positive the patient safety culture.

Table (3-3) shows the twelve dimensions of safety culture as measured by the HSOPSC, along with their respective definitions:

Table (3.3) Patient Safety Culture dimensions and definitions*

Patient safety culture dimensions	Definition: The extent to which...
Unit level dimensions	
1. Communication openness	Staff speak up freely if they see something that may affect a patient negatively and feel free to question those with more authority.
2. Feedback & communication about error	Staff are informed about errors that happen, are given feedback about changes implemented and discuss ways to prevent errors.
3. Teamwork within units	Staff support each other, treat each other with respect and work together as a team.
4. Non-punitive response to error	Staff feel that their mistakes and event reports are not held against them and that mistakes are not recorded in their personnel file.
5. Organisational learning-continuous improvement	Mistakes have led to positive changes and changes are evaluated for effectiveness.
6. Supervisor/manager expectations and actions promoting patient safety	Supervisors/managers consider staff suggestions for improving patient safety, praise staff for following patient safety procedures and do not overlook patient safety problems.
7. Staffing	There are enough staff to handle the workload and work hours are appropriate to provide the best care for patients.
Hospital level dimensions	
8. Teamwork across units	Hospital units cooperate and coordinate with one another to provide the best care for patients.
9. Handoffs and transitions	Important patient care information is transferred across hospital units and during shift changes.
10. Management support for patient safety	Hospital management provides a work climate that promotes patient safety and shows that patient safety is a top priority.
Outcome dimensions	
11. Frequency of events reported	Mistakes of the following types are reported: (1) mistakes caught and corrected before affecting the patient, (2) mistakes with no potential to harm the patient and (3) mistakes that could harm the patient, but do not.
12. Overall perceptions of patient safety	Procedures and systems are good at preventing errors and there is a lack of patient safety problems.

Source: *Adapted from (Sorra J, et al.2016).

3.5 Validity and Reliability Test:

3.5.1 Validity Test

The validity procedures for the study instrument were validated as follows: content, face validity, and construct validity. This is explained below.

Content Validity:

- The study tool's content validity was tested by collecting data from a variety of literature resources (books, working papers, research, thesis, journals, and articles).

Face Validity:

Furthermore, the researcher employed face validity, which was confirmed by the referees who evaluated the questionnaire. Accordingly, some of the questionnaire items were rephrased, changed, combined, and eliminated. Referring (Panel of Judge) (Appendix 1)

– Construct Validity (Principal Component Factor Analysis):

The questionnaire's validity was confirmed by performing an exploratory factor analysis (EFA) utilizing the principal components analysis method, Kaiser Meyer Olkin (KMO), varimax rotation, and a preset number of retrieved factors.

Loadings of more than 0.50 are acceptable if they exceed (0.40) (Hair et al. 2014). However, Kaiser Meyer Olkin (KMO) is used to assess sampling adequacy, harmony, and inter-correlations. KMO values between (0.8 - 1) suggest that high sampling is adequate and are approved if they surpass (0.5).

The Bartlett's of Sphericity indicator assesses data appropriateness and correlation. A significant result of less than $\alpha=0.05$ suggests a viable factor analysis. The variance percentage was also computed (Cerny & Kaiser 1977).

This is explained as follows:

1- Independent Variable (Digital Health Technologies Characteristics).

Table (3.4) reveals that the loading factor for Digital Health Technologies Characteristics items ranges from 0.698 to 0.817. Thus, construct validity is assumed. The KMO rating is 61.0%, indicating good adequacy, while the Chi² value is 12210.10, indicating the model's fitness. Furthermore, the variance percentage is 57.40, which means it can account for 57.40% of the variation. The significance of Bartlett's Sphericity is smaller than ($\alpha=0.05$), indicating that factor analysis is effective.

Table (3.4): Principal Component Analysis for the Digital Health Technologies Characteristics.

No.	Item	Loadings	KMO	Chi ²	DF	Var%	Sig.
1	The hospital develops easy usage to find correct information they need	0.792	0.610	12210.1	91	57.40	0.00
2	The hospital develops easy searching query health systems to find the information you are looking for	0.738					
3	The hospital provides different health systems to find the exact information you are looking for	0.734					
4	The hospital develops reliable health information	0.792					
5	The hospital identifies if health systems are influenced by commercial interests	0.805					
6	The hospital provides with health systems with matched information	0.728					
7	The hospital offers practical health systems	0.714					
8	The hospital provides health system that makes health decisions easier	0.793					
9	The hospital uses health systems that that ensure all information confidential	0.735					
10	The hospital provides employees with digital tools to express their opinions, thoughts regarding patient safety	0.727					
11	The hospital provides healthcare systems that prioritize security	0.794					

No.	Item	Loadings	KMO	Chi ²	DF	Var%	Sig.
12	The hospital saves employees' private information from (intentionally or unintentionally) sharing	0.817					
13	The hospital prevents (intentionally or unintentionally) staff from sharing patients private information	0.726					
14	Health systems utilization decreases the errors during work	0.698					

2- Dependent Variable (Patient Safety Culture).

Dimension 1: Teamwork within units.

Table (3.5) shows that the loading factor of Teamwork within unit's items scored between 0.711 and 0.808. Therefore, the construct validity is assumed. KMO has rated 86.7%, which indicates good adequacy, and the Chi2 is 1113.56, which indicates the fitness of the model. Moreover, the variance percentage is 56.30, so it can explain 56.30% of the variation. Finally, the significance of Bartlett's Sphericity is less than ($\alpha=0.05$), which indicates the factor analysis is useful.

Table (3.5): Principal Component Analysis for the Teamwork within units.

No.	Item	Loadings	KMO	Chi ²	DF	Var%	Sig.
1	The hospital uses an effective teamwork within units/work area	0.782					
2	The hospital employs enough staff to handle the workload	0.729					
3	The hospital keeps employees' work longer hours than is best for patient care	0.720					
4	The hospital exists an environment where staff help each other	0.785	0.867	1113.56	21	56.30	0.00
5	The hospital solves a problem with disrespectful behavior by those working within unit	0.808					
6	The hospital supports for staff involved in patient safety errors	0.712					
7	The hospital prevents the same patient safety problems keep happening	0.711					

Dimension 2: Non-punitive response to error.

Table (3.6) reveals that the loading factor for non-punitive response to mistake items ranged from 0.728 to 0.791. Thus, construct validity is assumed. KMO has a rating of 81.0%, indicating good adequacy, and the Chi2 is 590.805, indicating the model's fitness. Furthermore, the variance percentage is 57.426, which means it can account for 57.43% of the variation. The significance of Bartlett's Sphericity is smaller than ($\alpha=0.05$), indicating that factor analysis is effective.

Table (3.6): Principal Component Analysis for the non-punitive response to error.

No.	Item	Loadings	KMO	Chi ²	DF	Var%	Sig.
1	The hospital reports the mistake when caught and corrected before reaching the patient	0.781	0.810	590.805	10	57.426	0.00
2	The hospital reports when a mistake reaches the patient and could have harmed the patient but did not	0.728					
3	In the past 12 months, the hospital reported at least one patient safety events	0.749					
4	The hospital makes staff feel like their mistakes are held against them	0.791					
5	The hospital reports an event as a problem, not the person who did it	0.737					

Dimension 3: Learning & Continuous improvement.

Table (3.7) shows that the loading factor for Learning & Continuous Improvement items ranged from 0.668 to 0.833. Thus, construct validity is assumed. KMO has a rating of 82.9%, indicating good adequacy, and the Chi2 is 703.413, indicating the model's fitness. Furthermore, the variance percentage is 60.486, which explains 60.49% of the variation. The significance of Bartlett's Sphericity is smaller than ($\alpha=0.05$), indicating that factor analysis is effective.

Table (3.7): Principal Component Analysis for the Learning & Continuous improvement.

No.	Item	Loadings	KMO	Chi ²	DF	Var%	Sig.
1	The hospital management provides adequate resources to improve patient safety	0.814	0.829	703.413	10	60.486	0.00
2	Hospital management provides adequate trainings to improve patient safety	0.833					
3	The hospital regularly evaluates the changes over time to see how well patient safety improved	0.668					
4	The hospital regularly reviews work processes to determine if changes are needed to improve patient safety	0.777					
5	The hospital focuses on learning rather than blaming individuals	0.786					

Dimension 4: Communication: Openness/ Error feedback.

Table (3.8) reveals that the loading factor for Communication: Openness/Error feedback items ranged between 0.519 and 0.852. Thus, construct validity is assumed. KMO has a rating of 80.4%, indicating good adequacy, and the Chi² value is 1078.998, indicating model fitness. Furthermore, the variance percentage is 56.034, which explains 56.034% of the variation. The significance of Bartlett's Sphericity is smaller than ($\alpha=0.05$), indicating that factor analysis is effective.

Table (3.8): Principal Component Analysis for the Communication: Openness/ Error feedback.

No.	Item	Loadings	KMO	Chi ²	DF	Var%	Sig.
1	The hospital informed employees' about errors that happened	0.802	0.804	1078.998	15	56.034	0.00
2	The hospital discusses ways to prevent errors from happening again	0.813					
3	The hospital informs the employees' about the changes that are made based on event reports	0.852					
4	The hospital allows employees speak up if they see something that may negatively affect patient care	0.848					
5	The hospital allows employees' speak up when someone with more authority doing something unsafe for patients	0.588					
6	The hospital lets employees' ask questions when something does not seem right	0.519					

Dimension 5: Supervisor/manager expectations.

Table (3.9) reveals that the loading factor for Supervisor/manager expectations items ranged from 0.665 to 0.916. Thus, construct validity is assumed. KMO has a rating of 78.3%, indicating good adequacy, and the Chi2 is 1175.12, indicating the model's fitness. Furthermore, the variance percentage is 64.874, which explains 64.87% of the variation. The significance of Bartlett's Sphericity is smaller than ($\alpha=0.05$), indicating that factor analysis is effective.

Table (3.9): Principal Component Analysis for the Supervisor/manager expectations.

No.	Item	Loadings	KMO	Chi ²	DF	Var%	Sig.
1	My supervisor, manager, or clinical leader seriously considers staff suggestions for improving patient safety	0.798	0.783	1175.12	10	64.874	0.00
2	My supervisor, manager, or clinical leader wants to work faster during busy times, even if it means taking shortcuts	0.916					
3	My supervisor, manager, or clinical leader takes action to address patient safety concerns that are brought to their attention	0.732					
4	My supervisor, manager, or clinical leader provides adequate support to ensure patient safety	0.665					
5	My supervisor, manager, or clinical leader takes personal responsibility for maintaining patient safety	0.888					

3.5.2 Reliability Test

The data reliability is examined through Cronbach's alpha, the reliable tools have a Cronbach's alpha above (0.70) (Hair, et. al. 2014).

Table (3.10) shows that the Cronbach's alpha reliability of the Digital Healthcare Technologies was (0.942), for Patient Safety Culture dimensions is between (0.813 - 0.868), and for the Patient Safety Culture was (0.960).

Table (3.10): Reliability Test.

Variable	Items	Cronbach's Alpha
Independent Variable: Digital Health Technologies Characteristics’.	14	0.942
Teamwork within units	7	0.868
Non-punitive response to error	5	0.813
Learning & Continuous improvement	5	0.830
Communication: Openness/ Error feedback	6	0.838
Supervisor/manager expectations	5	0.854
Dependent Variable: Patient Safety Culture.	28	0.960

4.1.1 Analysis of Study Demographic Data

The Table (3.11) shows the results of the demographic data analysis, frequencies and percentages in the selected private hospitals in Amman, Jordan (Al Amal Hospital, Al Khalidi Hospital, Al Kindi Hospital, Arab Medical Centre, Islamic Hospital, Istklal Hospital, & Jordan Hospital):

Table (3.11): Demographic Data for the study sample

NO.1	Variable	Category	Frequency	Percentage%
1	Gender	Male	284	74.7
		Female	96	25.3
		Total	380	100%
2	What is your current position in this hospital?	Doctor	75	19.7
		Nursing	60	15.8
		Supervisor, Manager, Clinical Leader, Senior Leader	42	11.1
		Dietitian	27	7.1
		Pharmacist, Pharmacy Technician	25	6.6
		Physical, Occupational, or Speech Therapist	22	5.8
		Psychologist	22	5.8
		Respiratory Therapist	24	6.3

NO.1	Variable	Category	Frequency	Percentage%
		Social Worker	20	5.3
		Technologist, Technician (e.g., EKG, Lab, Radiology)	40	10.5
		Other: please specify	23	6.1
		Total	380	100%
3	How long have you worked in this hospital?	Less than 1 year	147	38.7
		1 to 5 years	132	34.7
		6 to 10 years	73	19.2
		11 or more years	28	7.4
		Total	380	100%
4	What is your qualification?	Diploma	120	31.6
		Bachelor's degree	140	36.8
		Master's degree or higher	120	31.6
		Total	380	100%
5	Hospital Name: (Optional)	Jordan Hospital	82	21.6
		Islamic Hospital	40	10.5
		Al Amal Hospital	41	10.8
		Al Khalidi Hospital	18	4.7
		Arab Medical Center	55	14.5
		Istiklal Hospital	80	21.1
		Al Kindi Hospital	64	16.8
		Total	380	100%

The study sample's demographic data, presented in Table (3.10), reveals that out of the 380 participants, 74.7% are male and 25.3% are female. Regarding their current positions in the hospital, doctors account for 19.7%, nursing staff for 15.8%, and supervisors, managers, clinical leaders, and senior leaders for 11.1%. The length of employment shows that 38.7% have worked in the hospital for less than 1 year, while 34.7% have worked between 1 and 5 years. In terms of qualifications, 31.6% hold a

diploma, 36.8% have a bachelor's degree, and an equal percentage (31.6%) possess a master's degree or higher. The study sample represents various hospitals, with Jordan Hospital being the largest at 21.6%. These findings provide valuable insights into the composition of the sample and the demographic characteristics within the hospital setting.

CHAPTER FOUR

Study Results and Hypotheses Test

4.1 Introduction

This chapter discusses the study's findings, which included analyzing data from the study sample in order to meet the study's objectives. The study sought to determine the impact of Digital Health Technologies (DHT) on Patient Safety Culture (PSC) and its dimensions at private hospitals in Amman, Jordan, using digital health technology characteristics as an independent variable and Patient Safety Culture dimensions as a dependent variable. The following section has a full presentation of these findings.

4.2 Data analysis

This section of the study provides an analysis of the study demographics, dimensions, and variables by examining the responses of the study sample responders to the specific measurement items in the study tool.

4.2.1 Descriptive analysis of study variables:

Mean, Standard Deviation, t-value, Ranking, and Implementation Level were used to investigate the level of implementation. Also, the following equation was also adopted to determine the relative significance adopted to comment on the variables' mean, as follows (Hsiao, 2014):

Relative significance = (maximum alternative - minimum alternative)/number of levels.

The implementation level is divided into three categories based on the following formula:

$$(5-1)/3 = 1.33$$

Here is how to assess the relative importance of items:

1 – 2.33	2.34 – 3.66	3.67 – 5	Class
Low	Medium	High	Implementation

Independent Variable (Digital Health Technologies Characteristics)

To answer the study question: “What is the level of implementing digital health technology in private hospitals in Amman, Jordan?”, the table (4.1) shows the mean Level of Digital Health Technologies Characteristics items ranges from 3.99 to 4.34. This implies that respondents agree on strong implementation of the Level of Digital Health Technologies Characteristics elements, as evidenced by a high t-value relative to the T-tabulated. The average mean is 4.15 indicating that respondents are very aware and concerned about their level of development ($t\text{-value} = 29.656 > T\text{-tabulated} = 1.960$).

Table (4.1): Mean, t-value, Ranking, and Implementation Level of Level of Digital Health Technologies Characteristics’

No.	Items	M.	t	Sig.	Rank	Impl.
1	The hospital develops easy usage to find correct information they need	4.09	19.929	0.00	8	High
2	The hospital develops easy searching query health systems to find the information you are looking for	4.00	18.928	0.00	11	High
3	The hospital provides different health systems to find the exact information you are looking for	4.03	20.887	0.00	9	High
4	The hospital develops reliable health information	4.25	25.204	0.00	3	High
5	The hospital identifies if health systems are influenced by commercial interests	4.33	29.479	0.00	2	High
6	The hospital provides with health systems with matched information	4.18	22.165	0.00	4	High
7	The hospital offers practical health systems	4.17	22.137	0.00	5	High
8	The hospital provides health system that makes health decisions easier	4.10	19.929	0.00	7	High
9	The hospital uses health systems that that ensure all information confidential	3.99	18.823	0.00	12	High
10	The hospital provides employees with digital tools to express their opinions, thoughts regarding patient safety	4.01	20.690	0.00	10	High

No.	Items	M.	t	Sig.	Rank	Impl.
11	The hospital provides healthcare systems that prioritize security	4.25	25.275	0.00	3	High
12	The hospital saves employees' private information from (intentionally or unintentionally) sharing	4.34	29.332	0.00	1	High
13	The hospital prevents (intentionally or unintentionally) staff from sharing patients private information	4.17	21.761	0.00	5	High
14	Health systems utilization decreases the errors during work	4.14	21.656	0.00	6	High
	Digital Health Technologies Characteristics'	4.15	29.656	0.00		High

T-tabulated=1.960

Dependent Variable (Patient Safety Culture)

In order to answer the second question of the study: "What is the level of practicing PSC in private hospital in Amman, Jordan?", the table (4.2) shows that the means of the Patient Safety Culture sub variables range from 4.11 to 4.21. This implies that respondents agree on the high adoption of Patient Safety Culture sub-variables, as seen by a high t-value compared to T-tabulated. The average mean is 4.14, showing that respondents are very aware and concerned about Patient Safety Culture. The t-value is 34.814 > T-tabulated = 1.960.

Table (4.2): Mean, t-value, Ranking, and Implementation Level of Patient Safety Culture.

No.	Dimensions	M.	t	Sig.	Rank	Impl.
1	Teamwork within units	4.16	30.137	0.00	3	High
2	Non-punitive response to error	4.14	28.999	0.00	4	High
3	Learning & Continuous improvement	4.11	29.321	0.00	5	High
4	Communication: Openness/ Error feedback	4.17	32.225	0.00	2	High
5	Supervisor/manager expectations	4.21	36.349	0.00	1	High
	Patient Safety Culture	4.14	34.824	0.00		High

T-tabulated=1.960

– **1st Dimension: Teamwork within units.**

Table (4.3) reveals that the mean Teamwork within unit items ranges from 3.99 to 4.36. This implies that respondents agree on a high level of Teamwork within unit items, as evidenced by a high t-value compared to the T-tabulated. The average mean is 4.15 indicating that respondents are extremely aware and concerned about teamwork within units ($t\text{-value} = 30.137 > T\text{-tabulated} = 1.960$).

Table (4.3): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Teamwork within units.

No.	Items	M.	S.D.	t	Sig.	Rank	Impl.
1	The hospital uses an effective teamwork within units/work area	4.10	1.07	20.004	0.00	5	High
2	The hospital employs enough staff to handle the workload	3.99	1.03	18.683	0.00	7	High
3	The hospital keeps employees' work longer hours than is best for patient care	4.01	0.96	20.643	0.00	6	High
4	The hospital exists an environment where staff help each other	4.27	0.97	25.454	0.00	2	High
5	The hospital solves a problem with disrespectful behavior by those working within unit	4.36	0.87	30.357	0.00	1	High
6	The hospital supports for staff involved in patient safety errors	4.18	1.04	22.165	0.00	3	High
7	The hospital prevents the same patient safety problems keep happening	4.17	1.03	22.059	0.00	4	High
	Teamwork within units	4.15	0.75	30.137	0.00		High

T-tabulated=1.960

– **2nd Dimension: Non-punitive response to error.**

Table (4.4) reveals that the averages for non-punitive response to error items vary from 3.99 to 4.32, with a standard deviation of 0.90 to 1.07. This implies that respondents agree on the high implementation of non-punitive response to incorrect items, as

evidenced by a high t-value when compared to the T-tabulated. The overall mean is 4.14 with a standard deviation of 0.77, indicating that respondents are extremely attentive and concerned about non-punitive response to error (t-value = 28.999 > T-tabulated = 1.960).

Table (4.4): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Non-punitive response to error.

No.	Items	M.	S.D.	t	Sig.	Rank	Impl.
1	The hospital reports the mistake when caught and corrected before reaching the patient	4.32	0.90	28.488	0.00	1	High
2	The hospital reports when a mistake reaches the patient and could have harmed the patient but did not	4.16	1.04	21.741	0.00	2	High
3	In the past 12 months, the hospital reported at least one patient safety events	4.16	1.03	21.709	0.00	2	High
4	The hospital makes staff feel like their mistakes are held against them	4.09	1.07	19.929	0.00	3	High
5	The hospital reports an event as a problem, not the person who did it	3.99	1.02	18.823	0.00	4	High
	Non-punitive response to error	4.14	0.77	28.999	0.00		High

T-tabulated=1.960

– 3rd Dimension: Learning and Continuous improvement.

Table (4.5) demonstrates that the mean Learning and Continuous Improvement items range between 3.84 and 4.27, with a standard deviation of 0.83 to 1.07. This suggests that respondents agree on the high implementation of the Learning and Continuous Improvement items, as evidenced by a high t-value compared to the T-tabulated. The average mean is 4.11 with a standard deviation of 0.74, indicating that respondents are extremely attentive and concerned about learning and continuous improvement (t-value = 29.321, T-tabulated = 1.960).

Table (4.5): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Learning and Continuous improvement.

No.	Items	M.	S.D.	t	Sig.	Rank	Impl.
1	The hospital management provides adequate resources to improve patient safety	3.98	0.94	20.525	0.00	4	High
2	Hospital management provides adequate trainings to improve patient safety	4.17	0.92	24.788	0.00	2	High
3	The hospital regularly evaluates the changes over time to see how well patient safety improved	3.84	1.07	15.402	0.00	5	High
4	The hospital regularly reviews work processes to determine if changes are needed to improve patient safety	4.27	0.83	29.739	0.00	1	High
5	The hospital focuses on learning rather than blaming individuals	4.16	1.00	24.738	0.00	3	High
	Learning and Continuous improvement	4.11	0.74	29.321	0.00		High

T-tabulated=1.960

– 4th Dimension: Communication: Openness/ Error feedback.

Table (4.6) reveals that the means for Communication: Openness/Error feedback items vary from 4.06 to 4.33, with a standard deviation of 0.84 to 1.07. This implies that respondents agree on the high implementation of Communication: Openness/Error feedback items, as evidenced by a high t-value relative to the T-tabulated. The average mean is 4.17 with a standard deviation of 0.71, indicating that respondents are extremely aware and worried about Communication: Openness/Error feedback (t-value = 32.225 > T-tabulated = 1.960).

Table (4.6): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Communication: Openness/ Error feedback.

No.	Items	M.	S.D.	t	Sig.	Rank	Impl.
1	The hospital informed employees' about errors that happened	4.15	0.90	24.959	0.00	3	High
2	The hospital discusses ways to prevent errors from happening again	4.09	0.97	21.945	0.00	5	High

No.	Items	M.	S.D.	t	Sig.	Rank	Impl.
3	The hospital informs the employees' about the changes that are made based on event reports	4.06	1.07	19.312	0.00	6	High
4	The hospital allows employees speak up if they see something that may negatively affect patient care	4.12	0.98	22.438	0.00	4	High
5	The hospital allows employees' speak up when someone with more authority doing something unsafe for patients	4.33	0.84	30.897	0.00	1	High
6	The hospital lets employees' ask questions when something does not seem right	4.24	0.92	26.199	0.00	2	High
	Communication: Openness/ Error feedback	4.17	0.71	32.225	0.00		High

T-tabulated=1.960

– 5th Dimension: Supervisor/manager expectations.

Table (4.7) reveals that the averages for Supervisor/manager expectations items vary from 4.17 to 4.35, with a standard deviation of 0.87 to 1.04. This implies that respondents agree on the high execution of Supervisor/Manager expectations items, as evidenced by a high t-value compared to the T-tabulated. The average mean is 4.21 with a standard deviation of 0.65, indicating that respondents are extremely aware and anxious about supervisor/manager expectations ($t\text{-value} = 36.349 > T\text{-tabulated} = 1.960$).

Table (4.7): Mean, Standard Deviation, t-value, Ranking, and Implementation Level of Supervisor/manager expectations.

No.	Items	M.	S.D.	t	Sig.	Rank	Impl.
1	My supervisor, manager, or clinical leader seriously considers staff suggestions for improving patient safety	4.26	0.97	25.347	0.00	3	High
2	My supervisor, manager, or clinical leader wants to work faster during busy times, even if it means taking shortcuts	4.35	0.87	30.209	0.00	1	High
3	My supervisor, manager, or clinical leader takes action to address patient safety concerns that are brought to their attention	4.18	1.04	22.015	0.00	4	High

No.	Items	M.	S.D.	t	Sig.	Rank	Impl.
4	My supervisor, manager, or clinical leader provides adequate support to ensure patient safety	4.17	1.03	22.059	0.00	5	High
5	My supervisor, manager, or clinical leader takes personal responsibility for maintaining patient safety	4.32	0.90	28.488	0.00	2	High
	Supervisor/manager expectations	4.21	0.65	36.349	0.00		High

T-tabulated=1.960

4.2.2 Relationship between Independent and Dependent Variables:

To answer the third study question: “Is there a relationship between DHT and PSC in private hospitals in Amman, Jordan?”, The researcher employed the Pearson Correlation Test to determine the relationship between the study's variables. Table (4.8) displays the correlations between Digital Healthcare Technologies and Patient Safety Culture sub variables. There is a substantial association between digital healthcare technologies and patient safety culture (0.89). Furthermore, the link between patient safety culture sub-variables is substantial, with R-values ranging from 0.55 to 0.95.

Table (4.8): Relationship between the Variables of the study.

No.	Dimensions	1	2	3	4	5	6	7
1	Independent Variable: Digital Health Technologies Characteristics’.	-						
2	Teamwork within units	0.96**	-					
3	Non-punitive response to error	0.95**	0.95**	-				
4	Learning & Continuous improvement	0.75**	0.78**	0.74**	-			
5	Communication: Openness/ Error feedback	0.69**	0.72**	0.65**	0.76**	-		
6	Supervisor/manager expectations	0.62**	0.65**	0.61**	0.55**	0.64**	-	
7	Dependent Variable: Patient Safety Culture.	0.89**	0.93**	0.87**	0.88**	0.86**	0.79**	-

** . Correlation is significant at the 0.01 level (2-tailed).* . Correlation is significant at the 0.05 level (2-tailed).

4.3 Hypothesis Testing

The following tests should be carried out to ensure the validity of regression analysis (Sekaran, 2003); normality, linearity test, equal variance, multi-collinearity, in addition to the previously confirmed validity, reliability, and correlation tests.

- **Normality:** Figure (4.1) shows that the shape follows the normal distribution, in such case the model does not violate this assumption.

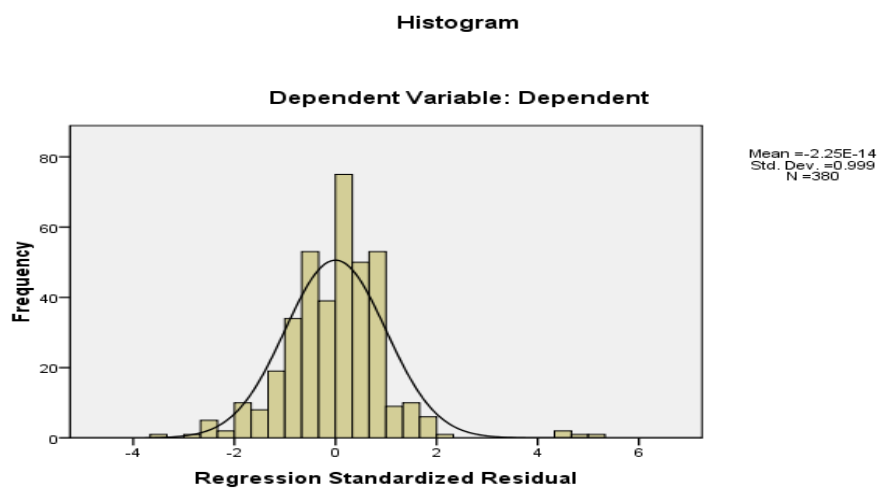


Figure (4.1): Normality Test

- **Linearity test:** Figure 4.2 indicates a linear relationship between the independent variable (Digital Health Technologies Characteristics) and the dependent variable (Patient Safety Culture); the model does not violate this assumption.

Normal P-P Plot of Regression Standardized Residual

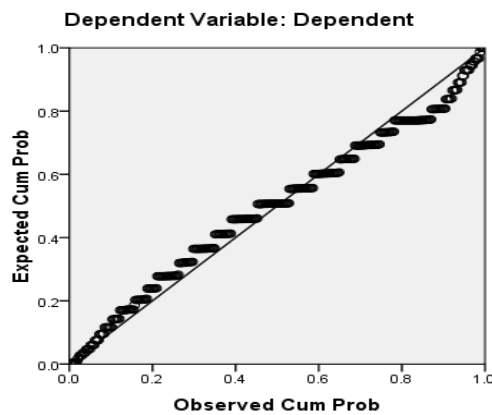


Figure (4.2): Linearity Test.

- **Equal variance (homoscedasticity):** Figure (4.3) demonstrates that the errors are distributed around the mean, implying that there is no relationship between errors and expected values; the model does not violate this assumption.

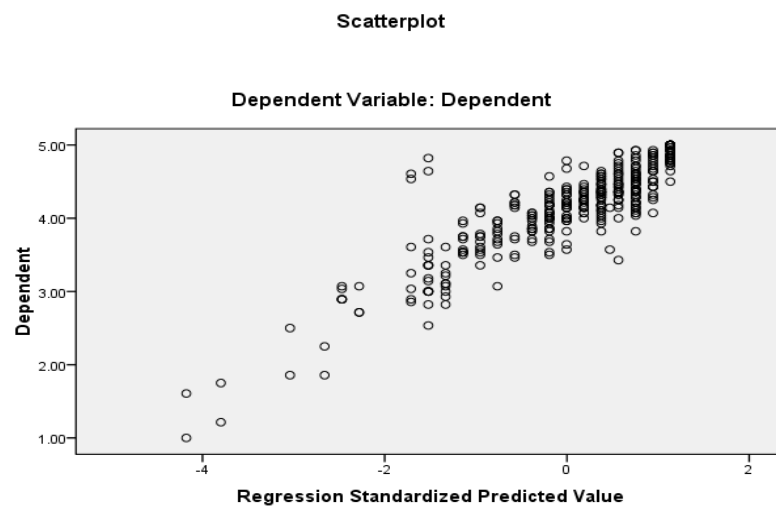


Figure (4.3): Equal variance.

- **Multi-Collinearity:** Table (4.9) show the VIF (Variance Inflation Factor) value is less than 10, and tolerance is more than 10%, in such case the Collinearity model does not violate this assumption.

Table (4.9): Tolerance and Variance Inflation Factor.

Variable	Collinearity Statistics	
	Tolerance	VIF
Digital Health Technologies Characteristics'	0.2404	4.159

4.4 Multiple Linear Regressions

Table (4.10) shows that there is an impact of the dimensions of the **Patient Safety Culture** on **Digital Health Technologies Characteristics**, where ($F= 1198.2$, $\text{sig.}=0.00$, $p<0.05$). Therefore, the null hypothesis is rejected, and the alternative hypothesis states that: There is an impact of dimensions of the **Patient Safety Culture** on Digital Health Technologies Characteristics in Private Hospitals in Amman, Jordan by ($\alpha \geq 0.05$).

Table (4.10): Multiple Linear Regressions dimensions of the Patient Safety Culture on Digital Health Technologies Characteristics.

Model	R	R ²	Adjusted R ²	F	Sig.
1	0.970	0.941	0.940	1198.2	0.000

a. Predictors: (Constant), Patient Safety Culture.

b. Dependent Variable: Digital Health Technologies Characteristics.

Table (4.11) shows the impact of the dimensions of the Patient Safety Culture on

Digital Health Technologies Characteristics, where the impacted was 94%.

Table (4.11): Multiple Linear Regressions of the dimensions of the Patient Safety Culture on Digital Health Technologies Characteristics (ANOVA).

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.082	0.067		1.225	0.221
	Teamwork within units	0.210	0.046	0.210	4.171	0.000
	Non-punitive response to error	0.124	0.039	0.124	3.824	0.000
	Learning & Continuous improvement	0.240	0.023	0.240	4.556	0.000
	Communication: Openness/ Error feedback	0.156	0.023	0.156	3.142	0.000
	Supervisor/manager expectations	0.142	0.020	0.142	3.01	0.000

a. Dependent Variable: Digital Health Technologies Characteristics, T-tabulated=1.960

4.5 Main Hypothesis testing:

H01: There is no impact of Digital Health Technologies Characteristics on the Patient Safety Culture in Private Hospitals in Amman, Jordan by ($\alpha \geq 0.05$).

The analysis provided focuses on hypothesis testing and multiple linear regressions to investigate the impact of Digital Health Technologies Characteristics on Patient Safety Culture in private hospitals in Amman, Jordan.

The main hypothesis (H01) states that there is no impact of Digital Health Technologies Characteristics on Patient Safety Culture, with the significance level (α) set at 0.05. The subsequent analysis reveals significant findings that lead to the rejection of the null hypothesis.

The multiple linear regressions presented in Table (4.11) demonstrate that the dimensions of Patient Safety Culture have a significant impact on Digital Health Technologies Characteristics. The F-value of 1198.2 and the significance level (p-value) of 0.000 ($p < 0.05$) indicate strong evidence against the null hypothesis. Consequently, the alternative hypothesis is accepted, suggesting that there is an impact of Patient Safety Culture dimensions on Digital Health Technologies Characteristics in private hospitals in Amman, Jordan.

Table (4.11) provides additional information on the regression model's performance. The R-squared value of 0.941 indicates that approximately 94.1% of the variance in Digital Health Technologies Characteristics can be explained by the dimensions of Patient Safety Culture. This suggests a strong relationship between these variables in the given context.

4.5.1 Sub Hypothesis testing

H01.1: There is no impact of Digital Health Technologies Characteristics on the Teamwork within units in Private Hospitals in Amman, Jordan by ($\alpha \geq 0.05$).

Table (4.11), the standardized coefficient (Beta) for the dimension "Teamwork within units" is 0.210. Since this coefficient is nonzero and positive, it suggests that there is a significant positive impact of Digital Health Technologies Characteristics on Teamwork within units in private hospitals in Amman, Jordan. Additionally, the t-value associated with the "Teamwork within units" dimension is 4.171, and the corresponding p-value is 0.000 ($p < 0.05$). This indicates that the impact of Digital Health Technologies Characteristics on Teamwork within units is statistically significant.

Given these findings, we can reject the null hypothesis (H01.1) that there is no impact of Digital Health Technologies Characteristics on Teamwork within units in private hospitals in Amman, Jordan. The results suggest that Digital Health Technologies Characteristics do have a significant positive impact on promoting teamwork within units in the context of these hospitals.

H01.2: There is no impact of Digital Health Technologies Characteristics on the Non-punitive response to error in Private Hospitals in Amman, Jordan by ($\alpha \geq 0.05$).

The table (4.11) provides information on the impact of each dimension of Patient Safety Culture on Digital Health Technologies Characteristics. The standardized coefficient (Beta) for the dimension "Non-punitive response to error" in Table (4.11), we can observe that it is 0.124. As the coefficient is nonzero and positive, it suggests that there is a significant positive impact of Digital Health Technologies Characteristics on promoting a non-punitive response to error in private hospitals in Amman, Jordan.

Furthermore, the t-value associated with the "Non-punitive response to error" dimension is 3.824, and the corresponding p-value is 0.000 ($p < 0.05$). These values

indicate that the impact of Digital Health Technologies Characteristics on the Non-punitive response to error is statistically significant.

Based on these findings, we can reject the null hypothesis (H01.2) that there is no impact of Digital Health Technologies Characteristics on the Non-punitive response to error in private hospitals in Amman, Jordan. The results suggest that Digital Health Technologies Characteristics indeed have a significant positive impact on fostering a non-punitive response to error within the context of these hospitals.

H01.3: There is no impact of Digital Health Technologies Characteristics on the Learning & Continuous improvement in Private Hospitals in Amman, Jordan by ($\alpha \geq 0.05$).

Table (4.11), the standardized coefficient (Beta) for the dimension "Learning & Continuous improvement" is 0.240. As the coefficient is nonzero and positive, it suggests that there is a significant positive impact of Digital Health Technologies Characteristics on fostering learning and continuous improvement in private hospitals in Amman, Jordan.

Additionally, the t-value associated with the "Learning & Continuous improvement" dimension is 4.556, and the corresponding p-value is 0.000 ($p < 0.05$). These values indicate that the impact of Digital Health Technologies Characteristics on Learning & Continuous improvement is statistically significant.

Based on these findings, we can reject the null hypothesis (H01.3) that there is no impact of Digital Health Technologies Characteristics on Learning & Continuous improvement in private hospitals in Amman, Jordan. The results suggest that Digital Health Technologies Characteristics indeed have a significant positive impact on promoting learning and continuous improvement within the context of these hospitals.

H01.4: There is no impact of Digital Health Technologies Characteristics on the Communication; (Openness/ Error Feedback) in Private Hospitals in Amman, Jordan by ($\alpha \geq 0.05$).

Table (4.11), the standardized coefficient (Beta) for the dimension "Communication: Openness/Error Feedback" is 0.156. Since the coefficient is nonzero and positive, it suggests that there is a significant positive impact of Digital Health Technologies Characteristics on promoting communication openness and error feedback in private hospitals in Amman, Jordan. Furthermore, the t-value associated with the "Communication: Openness/Error Feedback" dimension is 3.142, and the corresponding p-value is 0.000 ($p < 0.05$). These values indicate that the impact of Digital Health Technologies Characteristics on Communication: Openness/Error Feedback is statistically significant.

Based on these findings, we can reject the null hypothesis (H01.4) that there is no impact of Digital Health Technologies Characteristics on Communication: Openness/Error Feedback in private hospitals in Amman, Jordan. The results suggest that Digital Health Technologies Characteristics do have a significant positive impact on promoting communication openness and error feedback within the context of these hospitals.

H01.5: There is no impact of Digital Health Technologies Characteristics on the Supervisor/Manager expectations in Private Hospitals in Amman, Jordan by ($\alpha \geq 0.05$).

Table (4.11), the standardized coefficient (Beta) for the dimension "Supervisor/Manager expectations" is 0.198. As the coefficient is nonzero and positive, it suggests that there is a significant positive impact of Digital Health Technologies Characteristics on Supervisor/Manager expectations in private hospitals in Amman, Jordan.

Furthermore, the t-value associated with the "Supervisor/Manager expectations" dimension is 3.977, and the corresponding p-value is 0.000 ($p < 0.05$). These values indicate that the impact of Digital Health Technologies Characteristics on Supervisor/Manager expectations is statistically significant.

Based on these findings, we can reject the null hypothesis (H01.5) that there is no impact of Digital Health Technologies Characteristics on Supervisor/Manager expectations in private hospitals in Amman, Jordan. The results suggest that Digital Health Technologies Characteristics do have a significant positive impact on shaping Supervisor/Manager expectations within the context of these hospitals.

In summary, the analysis supports the notion that Digital Health Technologies Characteristics have a significant impact on Patient Safety Culture in private hospitals in Amman, Jordan. The findings highlight the importance of factors such as teamwork, non-punitive response to error, continuous improvement, communication, and supervisor/manager expectations in fostering a positive patient safety culture within the context of digital health technologies.

CHAPTER FIVE

Discussion, Conclusion, and Recommendations

5.1 Introduction

This chapter presents the study's findings, as well as an analysis and interpretation based on relevant theoretical literature and previous investigations. These findings were acquired by using research tools to the study sample and conducting statistical analyses on the data. The chapter contains descriptive analysis of the study variables, hypothesis testing, and a summary of the researcher's findings. Furthermore, recommendations and suggestions for future investigations based on the findings are offered in detail, as described in Chapter Four.

5.2 Discussion of descriptive analysis:

Digital Health Technologies Characteristics:

The findings show that respondents usually agree on a high level of application of Digital Health Technologies characteristics. This shows that respondents are well aware of and concerned about the state of development of digital health technologies. The findings show that hospitals were effective in creating user-friendly health systems, dependable health information, and systems that prioritize security.

The items with the highest mean scores and rankings include "The hospital saves employees' private information from sharing" (ranked 1), which agrees with a study by Opoku-Agyemang, (2021) that showed that optimal deployment of patient portals while ensuring data privacy is encouraging. Another argument by Tafheem et al. (2022) is that such hospitals have dedicated cybersecurity specialists to maintain digital privacy and safety, and that awareness is not required at hospitals due to the security policies employed.

Furthermore, the use of health systems is thought to reduce errors at work, emphasizing the effectiveness of the digital health technology applied. The study of Campione et al. (2019) supports the findings that the installation of electronic health records has the potential to improve medication recording, decision assistance, shared decision-making in treatment, and care coordination.

The item "The hospital uses health systems that ensure all information are confidential" received the lowest mean score and ranks, indicating probable issues or flaws in the hospital's adoption of confidentiality measures within their health systems. Adeleke et al. (2011) discovered in their study that, while professionals were generally aware of the necessity of secrecy, there was a significant discrepancy in their level of knowledge and understanding of their individual obligations. This emphasizes the importance of regular reminders and continuing education to ensure a thorough grasp and adherence to confidentiality regulations.

Furthermore, the data indicate that the hospital has successfully established user-friendly health systems, trustworthy health information, and security-focused systems. Respondents believe that utilizing these health systems will help to reduce workplace mishaps. Additionally, the hospital provides digital tools for employees to express their views on patient safety while maintaining the anonymity of all information. These components help the hospital deliver digital tools to employees while also preventing illegal sharing of sensitive patient data.

Patient Safety Culture:

The findings indicate that respondents had a high level of agreement on the adoption of Patient Safety Culture at private hospitals in Amman, Jordan. Previous research supports these findings, with Naderi et al. (2019) emphasizing the necessity of developing

a Patient Safety Culture in guaranteeing high-quality patient care. Another study, Karademirler & Manav (2021), underlined the importance of assessing the level of Patient Safety Culture in order to get insight into the existing safety culture inside healthcare organizations. Hellings et al. (2010) also conducted a study emphasizing the importance of safety as a vital part of service quality when examining the safety culture within hospitals.

The respondents agreed on high implementation of supervisor/manager expectations items, as evidenced by a high t-value: this is consistent with the study conducted by Etherington C et al. (2019), which found that team members who expressed support for the technology stated that their endorsement was contingent on its implementation with the goal of fostering a culture of patient safety, improving care processes, and improving patient outcomes. Singer, S. et al. (2009) discovered that PSC is a shared value among institutional staff regarding the operation of work units and interactions between systems, which together produce institutional behavioral norms that promote safety. PSC has a significant impact on safety outcomes, including reporting frequency and overall perceptions of patient safety.

5.3 Discussion of the results related to the main hypotheses:

The study's findings revealed numerous key factors about the primary theories. These findings will be explored in terms of the study's primary hypotheses: **“There is no impact of Digital Health Technologies Characteristics on the Patient Safety Culture in Private Hospitals in Amman, Jordan by ($\alpha \geq 0.05$)”**.

The findings support the hypothesis that digital health technologies have a major impact on patient safety culture in private hospitals in Amman, Jordan. This is consistent with the findings of Najafi et al. (2021) and Opoku-Agyemang (2021). Feldman et al.

(2018) emphasized that in order to maintain a culture of quality and safety for patients healthcare organizations need to adopt digital healthcare systems. systems.

5.4 Discussion of the result of the study hypotheses:

First Sub-Hypothesis (H01)

The study found that Digital Health Technologies have a significant impact on teamwork within units in private hospitals in Amman, Jordan ($\alpha \leq 0.05$), rejecting the first sub null hypothesis and accepting the alternative hypothesis. It turned out that the more private hospitals encourage teamwork within their departments, the greater the impact of the Patient Safety Culture on personnel. This finding is consistent with two studies conducted by Khater et al. (2015) and Hellings et al. (2010), which found that the "teamwork within hospital units" feature received a strong positive reaction.

Second Sub-Hypothesis (H02)

The analysis indicated that the second sub null hypothesis was rejected, whereas the alternative hypothesis was accepted: Digital Health Technologies have a statistically significant impact on non-punitive mistake responses at private hospitals in Amman, Jordan ($\alpha < 0.05$). It was discovered that the more private hospitals emphasize the "non-punitive response to error," the greater the impact of the overall Patient Safety Culture on staff. In other words, when private hospitals build a culture that views errors as opportunities for learning and progress rather than penalizing people, it increases the organization's overall patient safety philosophy and practices. Granel-Giménez et al., (2022) concurred with the finding that the non-punitive reaction shows a positive safety culture.

Third Sub-Hypothesis (H03)

The study found that digital health technologies have a significant impact on learning and continuous improvement in private hospitals in Amman, Jordan ($\alpha \leq 0.05$). It turned discovered that the more private hospitals emphasize "Learning and Continuous Improvement," the greater the impact of the overall Patient Safety Culture on staff. Veljanovska and Borota (2023) propose that healthcare institutions improve training programs to ensure a high degree of patient safety.

Fourth Sub-Hypothesis (H04)

Based on the analysis, the study found that the fourth sub null hypothesis was rejected, whereas the alternative hypothesis was accepted: Digital health technologies have a statistically significant influence on communication, including openness and error feedback, in private hospitals in Amman, Jordan ($\alpha < 0.05$). It was discovered that the higher the "Communication: Openness/Error feedback" in private hospitals, the greater the impact of the overall Patient Safety Culture among personnel.

Fifth Sub-Hypothesis (H05)

Based on the analysis, the study found that the fourth sub null hypothesis was rejected, whereas the alternative hypothesis was accepted: Digital health technologies have a statistically significant impact on supervisor/manager expectations at private hospitals in Amman, Jordan ($\alpha < 0.05$). It was discovered that the more private hospitals elevate "supervisor/manager expectations," the greater the impact of the overall Patient Safety Culture on personnel. In other words, by raising supervisor/manager standards, private hospitals can effectively promote and strengthen a culture of patient safety throughout their facilities. Bump et al. (2015) found that manager/supervisor activities improving patient safety and staffing had a greater influence on outcomes.

5.5 Recommendation

Based on the results revealed and discussed earlier, it is important to leverage digital health technologies to improve patient safety culture in private hospitals in Amman, Jordan, in order to maintain proper healthcare service, as well as to affirm a safe environment for both healthcare providers and patients by affirming the patient safety culture dimensions, and patient safety-promoting actions.

Furthermore, some of the findings allow for the following recommendations to improve the Patient Safety Culture in private hospitals in Amman, Jordan:

- 1- Provide employees with clear standards and necessary resources to assist understanding patient safety culture. By regularly addressing & updating on the policies & guidelines related to the patient safety.
- 2- Regularly evaluate the effectiveness and impact of digital health technologies on patient safety by collecting feedback from healthcare professionals to identify areas for improvement and address any usability or functionality issues.
- 3- Engage in continuous quality improvement initiatives to optimize the utilization of digital health technologies and their positive impact on patient safety.
- 4- Regularly communicate and remind staff about the shared values, expectations, and commitment to patient safety. This can be done through meetings, newsletters, posters, or electronic communication platforms.
- 5- Develop and implement a standardized communication protocols for protocols: critical situations, handoffs, and shift changes. These protocols ensure consistent and structured communication, reducing the chances of important information being missed or misunderstood.

- 6- Develop a professional opportunity in the hospitals in order to focus on employee teamwork within units: invest in professional development opportunities for team members. Support them in attending workshops, conferences, or training programs focused on teamwork, collaboration, and effective communication. This helps enhance their skills and knowledge, which in turn benefits the overall teamwork within units.
- 7- Promote free expression and a non-punitive approach to faults in the environment. Establish Confidential Reporting Systems: implement confidential reporting systems that allow employees to report errors, near misses, or unsafe conditions anonymously if they choose to do so. Ensure that these systems are easily accessible, user-friendly, and provide a safe avenue for employees to share their experiences and insights.
- 8- To enhance employees knowledge and skills in patient safety, by creating a centralized online platform or learning management system where employees can access relevant resources, participate in e-learning modules, and engage in virtual discussions or webinars.
- 9- Additionally, fostering a culture of self-directed learning and encourage employees to take ownership of their professional development, providing resources and guidance on accessing credible information sources, promoting participation in webinars or conferences, and supporting employees in pursuing certifications or advanced educational programs all contribute to empowering continuous learning and growth.

5.6 Directions for future studies:

The following suggestions are recommended for future studies:

- 1- Conducting further related study takes into account the different position levels within hospitals.
- 2- Conducting a related study on the impact of specific digital health technologies such as electronic health records (EHRs) or reporting systems on patient safety culture within private hospital in Jordan.
- 3- Conducting a related study on public hospitals in Jordan.
- 4- Conducting a comparison study between public and private hospitals in Jordan.
- 5- Conducting further studies related to patient safety culture in private Jordanian hospitals and its relationship with another variable.
- 6- Conducting further studies related to patient safety culture in private Jordanian hospitals and its relationship with another variable, such as leadership, or staffing and work environment.

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Appendices

Appendix (1): Referees Committee

The table below shows the used Questionnaire Referees Committee:

Name	Degree	University / filed
Prof. Dr. Abdel-Aziz Sharabati	Professor	Middle East University
Prof. Dr. Ahmad Al Ghandour	Professor	Middle East University
Prof Dr. Ahmad Ali Salih	Professor	Middle East University
Prof. Dr Ali Al-Adileh	Professor	Middle East University
Dr. Atef Kanan	Assistant Professor	Petra University
Dr. Mohammad Ma'aitah	Assistant Professor	Applied Science Private University
Dr. Sattam Almatarneh	Assistant Professor	Zarqa University
Dr. Ma'moun Ahmad Habiballah	Assistant Professor	Al Husin Bin Talal University

The names of the expert were arranged according to scientific rank and alphabetic letters.

Appendix (2): Questionnaire



Dear Sirs and Madams,

After Greetings,

Technological advancements play an important role in reshaping the concept of healthcare and delivering improved healthcare services, impacting on minimizing medical errors, and enhancing the efficiency of healthcare personnel using different Digital Health Technologies (DHT).

To further explore the impact of healthcare technologies on patient safety culture among healthcare providers, a study titled "The Impact of Digital Healthcare Technologies on Patient Safety Culture - A Field Study in Private Hospitals in Amman, Jordan" is being conducted. The study focuses on various dimensions of Patient Safety Culture, including teamwork, error response, continuous improvement, communication, and the expectations of supervisors/ managers in promoting a patient safety culture. Therefore, the researcher kindly requests your participation in the attached questionnaire, which should be filled out accurately and thoroughly.

Please be assured that all information provided in the questionnaire will be used solely for scientific research purposes. Confidentiality will be strictly maintained, and no one else will have access to the data.

Yours sincerely:

Supervisor: Dr. Fayez Albadri
Reem Al-Jarrah

Researcher:

Please select the appropriate answer in the appropriate place

يرجى اختيار الإجابة المناسبة في المكان المناسب:

Section 1: General Information Demographic Data.

القسم الأول: المعلومات العامة البيانات الديموغرافية:

- 1- Gender:
 - Male
 - Female
- 2- What is your current position in this hospital?
 - Doctors
 - Nursing
 - Supervisor, Manager, Clinical Leader, Senior Leader
 - Dietitian
 - Pharmacist, Pharmacy Technician
 - Physical, Occupational, or Speech Therapist
 - Psychologist
 - Respiratory Therapist
 - Social Worker
 - Technologist, Technician (e.g., EKG, Lab, Radiology)
 - Other: please specify:
- 3- How long have you worked in this hospital?
 - Less than 1 year
 - 1 to 5 years
 - 6 to 10 years
 - 11 or more years
- 4- What is your qualification?
 - Diploma
 - Bachelor's degree
 - Master's degree or higher
- 5- Hospital Name: (Optional)
 - Islamic Hospital
 - Al Amal Hospital
 - Al Khalidi Hospital
 - Arab Medical Center
 - Istiklal Hospital
 - Al Kindi Hospital

Section 2:

القسم الثاني:

Please select the appropriate answer in the appropriate place

- 5 Strongly Agree
4 Agree
3 Neutral
2 Disagree
1 Strongly Disagree

يرجى اختيار الإجابة المناسبة في المكان المناسب:

No.	Question	1	2	3	4	5
		1	2	3	4	5
Dependent Variable (Patient Safety Culture)						
1st Dimension (Teamwork within units)						
1	The hospital uses an effective teamwork within its units. يستخدم المستشفى عمل فريق فعال في داخل وحداته					
2	The hospital employs enough staff to handle the workload. يستخدم المستشفى عددًا كافيًا من الموظفين للتعامل مع الأعباء العملية					
3	The hospital keeps employees working longer hours. يجعل المستشفى موظفيه يعملون ساعات أطول					
4	The hospital creates a cooperative environment. يخلق المستشفى بيئة تعاونية تشجع الموظفين على مساعدة بعضهم البعض					
5	The hospital solves the problem related to respectful behavior by those working within the unit. يحل المستشفى المشاكل المتعلقة بالسلوك غير الاحترامي من قبل العاملين داخل الوحدات					
6	The hospital supports staff to care about patient safety. يقدم المستشفى الدعم للموظفين للاهتمام في سلامة المرضى					
2nd Dimension (Non-punitive response to error)						
7	The hospital prevents the mistake before reaching the patient. يمنع المستشفى الخطأ قبل وصوله للمريض					
8	The hospital protects from any misuse. يحمي المستشفى من أي سوء استخدام					
9	The hospital reports zero safety event within last 12 months. لم يرقم المستشفى بالإبلاغ عن أي حالة تتعلق بسلامة المرضى في الـ 12 شهرًا الماضية،					
10	The hospital helps employees to overcome their mistakes. يساعد المستشفى الموظفين بأن يتجاوزوا أخطائهم.					
11	The hospital reports an event as a problem, not the person who did it. يقوم المستشفى بالإبلاغ عن الخطأ كمشكلة، وليس الشخص الذي قام به.					
3rd Dimension (Learning & Continuous improvement)						
12	The hospital provides adequate resources to improve patient safety. يوفر المستشفى الموارد الكافية لتحسين سلامة المرضى.					
13	The hospital provides adequate training to improve patient safety. يوفر المستشفى التدريب الكافي لتحسين سلامة المرضى.					

14	The hospital evaluates the continuous safety improvement. يقوم المستشفى بتقييم تحسن سلامة المرضى بشكل منتظم.					
15	The hospital develops standard procedures to improve patient safety. يقوم المستشفى بتطوير معايير خطوات العمل لتحسين سلامة المرضى.					
16	The hospital focuses on learning rather than blaming individuals. يركز المستشفى على عملية التعلم بدلاً من إلقاء اللوم على الأفراد.					
4 th Dimension (Communication: Openness/ Error feedback)						
17	The hospital informs employees about errors that happened. يقوم المستشفى بإبلاغ موظفيه عن الأخطاء التي وقعت.					
18	The hospital discusses ways to prevent errors from happening again. يقوم المستشفى بمناقشة الطرق الممكنة لمنع حدوث الأخطاء مرة أخرى.					
19	The hospital informs the employees about the changes that are made based on event reports. يقوم المستشفى بإبلاغ موظفيه عن التغييرات التي تمت استناداً إلى تقارير الأحداث.					
20	The hospital allows employees to speak up if they see something that may negatively affect patient care. يتيح المستشفى لموظفيه التعبير إذا رأوا شيئاً قد يؤثر سلباً على رعاية المرضى.					
21	The hospital encourages employees to speak up when someone with more authority doing something wrong. يشجع المستشفى موظفيه على التعبير عندما يقوم شخص ذو سلطة أعلى بفعل شيء غير آمن للمرضى.					
22	The hospital allows employees to ask questions when something does not seem right. يسمح المستشفى للموظفين بطرح الأسئلة عندما يبدو أن هناك شيء غير صحيح.					
5 th dimension (Supervisor/manager expectations)						
23	The hospital encourages the supervisor to consider staff suggestions for improving patient safety. يشجع المستشفى المشرفين لأخذ اقتراحات الموظفين بعين الاعتبار لتحسين سلامة المرضى.					
24	The hospital supports the supervisor to work faster during busy times, even if it means taking shortcuts. يدعم المستشفى المشرفين للعمل بشكل أسرع خلال الأوقات المزدحمة، حتى لو تطلب ذلك اتخاذ اختصارات.					
25	The hospital encourages the supervisor to take action related to patient safety concerns. يشجع المستشفى المشرفين في أخذ الإجراءات المتعلقة بسلامة المرضى.					
26	The hospital supports the supervisor to provide adequate support to ensure patient safety. يدعم المستشفى المشرفين في تقديم الدعم الكافي لضمان سلامة المرضى.					
27	The hospital asks the supervisor to take personal responsibility for maintaining patient safety. يطلب المستشفى من المشرفين أخذ المسؤولية الشخصية في الحفاظ على سلامة المرضى.					
Independent Variable (Digital Health Technologies Characteristics')						
28	The hospital develops an easy information system to correct mistakes. يقوم المستشفى بتطوير أنظمة معلومات سهلة لتصحيح الأخطاء.					
29	The hospital develops easy searching query healthcare systems to find the information. يقوم المستشفى بتطوير نظم بحث سهلة الاستخدام للعثور على المعلومات.					

30	The hospital provides different healthcare systems to find the exact health information. يوفر المستشفى أنظمة صحية مختلفة للعثور على نفس المعلومات الصحية					
31	The hospital develops a reliable health information system. يقوم المستشفى بتطوير معلومات صحية موثوقة.					
32	The hospital prevents the healthcare systems from commercial interests. يمنع المستشفى الأنظمة الصحية من المصالح التجارية.					
33	The hospital provides healthcare systems with correct information. يقدم المستشفى أنظمة صحية تقدم معلومات صحيحة					
34	The hospital offers practical healthcare systems. يقدم المستشفى أنظمة صحية عملية.					
35	The hospital provides with healthcare systems that makes decisions easier. يزود المستشفى بأنظمة صحية تجعل عملية اتخاذ القرارات الصحية أسهل					
36	The hospital uses healthcare systems that ensure all information is confidential. يستخدم المستشفى أنظمة صحية تضمن سرية جميع المعلومات					
37	The hospital uses digital tools to let employees express their opinions, and thoughts regarding patient safety. يوفر المستشفى وسائل رقمية متطورة للموظفين للتعبير عن آرائهم وأفكارهم فيما يخص سلامة المرضى.					
38	The hospital provides secure healthcare systems. يوفر المستشفى أنظمة رعاية صحية آمنة					
39	The hospital protects employees private information from sharing. يحافظ المستشفى على سرية معلومات الموظفين الشخصية من نشرها					
40	The hospital prevents staff from sharing patients private information. يمنع المستشفى الموظفين من مشاركة معلومات المرضى الخاصة					
41	The hospital provides healthcare systems that decrease errors during work. يستخدم المستشفى أنظمة الرعاية الصحية التي تقلل من حدوث الأخطاء أثناء العمل					

Appendix (3): Facilitation Letter

مكتب رئيس الجامعة
Office of the President

الرقم: د/خ/ 3356
التاريخ: 2024/04/30

لمن يهمه الأمر

تحية طيبة وبعد ،

تهدىكم جامعة الشرق الأوسط أطيب وأصدق الأمنيات، لغايات توفير وربط أسس التعاون مع خدمة المجتمع المحلي؛ نرجو التكرم بالموافقة على تقديم التسهيلات الممكنة لطالبة الماجستير ريم عبد المهدي سعود الجراح، ورقمها الجامعي (402310113)، المسجلة في برنامج ماجستير إدارة الأعمال / كلية الأعمال في جامعة الشرق الأوسط، والتي تتولى القيام بإعداد دراسة بحثية أكاديمية في رسالتها المعنونه بـ " أثر تقنيات الرعاية الصحية الرقمية على ثقافة سلامة المرضى دراسة ميدانية في المستشفيات الخاصة في عمان الأردن" ، علماً بأن المعلومات سيتم استخدامها لأغراض البحث العلمي وبصورة سرية.

وتفضلوا بقبول فائق الاحترام والتقدير...

رئيسة الجامعة

أ.د. سلام خالد المحادين



Appendix (4): MOH approval letter



الرقم

التاريخ

الموافق

عدد المستشفيات الخاصة في محافظة العاصمة يبلغ (٤٧) سبعة وأربعون مستشفى

اسم المستشفى	الرقم
مستشفى دار السلام	١
مستشفى مجمع فرح الطبي	٢
مستشفى الكندي	٣
مستشفى الاردني الفنلندي	٤
مستشفى الامل	٥
مستشفى الجاردنز	٦
مستشفى العيون التخصصي	٧
مستشفى القدس	٨
مستشفى المركز العربي	٩
مستشفى المواساة	١٠
مستشفى عبد الهادي	١١
مركز العبدلي الطبي	١٢
مستشفى الحرمين	١٣
مستشفى تلاع العلي	١٤
مستشفى الحمائدة	١٥
مستشفى الرويال	١٦
مستشفى الشميساني	١٧
مستشفى الاردن	١٨
مستشفى الرشيد	١٩
عمان الجراحي	٢٠
مركز الخالدي الطبي	٢١
مستشفى الاستشاري	٢٢
مستشفى الاستقلال	٢٣
المستشفى الاسلامي	٢٤

رئيس المجلس الاعلى
د. نوره النوبختي



٢٠٢٤/٥/١٤

مستشفى الأقصى	٢٥
مستشفى التخصصي	٢٦
مستشفى الحنان	٢٧
مستشفى الحياة	٢٨
مستشفى المقاصد الخيرية	٢٩
مستشفى فيلادلفيا	٣٠
مستشفى ماركا التخصصي	٣١
مستشفى الايطالي عمان	٣٢
مستشفى السعودي	٣٣
مستشفى ابن الهيثم	٣٤
مستشفى عاقلة	٣٥
مستشفى الشرق الأوسط للعيون	٣٦
مستشفى الإسراء	٣٧
مستشفى الخنساء	٣٨
مستشفى الجزيرة	٣٩
مستشفى الاهلي	٤٠
مستشفى مركز الحسين للسرطان	٤١
مستشفى الهلال الاحمر	٤٢
مستشفى لوزميلا	٤٣
مستشفى هبه	٤٤
مستشفى عمان للتوليد	٤٥
مستشفى فرح	٤٦
مستشفى فلسطين	٤٧

د. نغمه ليمون
مديرة تخصص الكلى والكلى
مستشفى عمان العامة

٢٠١٤/٥/٢٤



(Handwritten signature)

Appendix (5): Approval Letter



مستشفى الأردن
JORDAN HOSPITAL



التاريخ : 2024/05/06

السادة جامعة الشرق الأوسط الكرام

تحية وبعد ،

لا مانع لدينا من تسهيل مهمة طالبة الماجستير "ريم عبد المهدي سعود الجراح" لإعداد رسالة
الماجستير بعنوان:

((أثر تقنيات الرعاية الصحية الرقمية على ثقافة سلامة المرضى دراسة ميدانية في

المستشفيات الخاصة في عمان-الأردن))

يرجى الإيعاز للمذكورة بمراجعة قسم العلاقات العامة لاستكمال الإجراءات .

وتفضلوا بقبول فائق الاحترام ،،،،

المدير الإداري

المهندس أحمد خطاب

نسخة الى :
— قسم العلاقات العامة
— قسم المالية

Administration Dep./Siyon Tabo

Appendix (6): Approval Letter

ARAB MEDICAL CENTER  المركز العربي الطبي

التاريخ: 2024/5/20

الرقم: م ع ط/أد / 64

السادة / جامعة الشرق الأوسط المحترمين

تحية طيبة وبعد،،،

اشاره الي كتابكم رقم د ر/خ / 1355 بتاريخ 2024/4/30 ، نعلمكم بالموافقه على تسهيل مهمه الطالبه ريم عبد المهدي سعود الجراح لاجراء البحث الخاص ب (أثر تقنيات الرعاية الصحية الرقمية على ثقافة سلامة المرضى دراسة ميدانية في المستشفيات الخاصة) على أن تكون المعلومات لأغراض البحث العلمي وبصورة سرية.

وتفضلوا بقبول فائق الاحترام،،،

المدير العام بالإتالية

معدت سمارة





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