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**The Effectiveness of Health Information Systems in Supporting Risk
Management Programs and Reducing Occupational Incidents in
Emergency Department in Saudi Hospitals**

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Contents

The Effectiveness of Health Information Systems in Supporting Risk Management Programs and Reducing Occupational Incidents in Emergency Departments in Saudi Hospitals	i
List of Tables	v
List of Figures.....	vi
Abstract	vii
CHAPTER ONE.....	1
General Framework of the Research	1
1.1 Introduction	1
1.2 Background of the Study	2
1.3 Literature Review (Brief Overview).....	3
1.4 Research Problem.....	3
1.5 Research Questions	4
1.6 Research Objectives	5
1.7 Significance of the Study.....	5
1.8 Research Methodology Overview	6
1.10 Scope and Limitations	7
1.11 Structure of the Thesis	7
CHAPTER TWO.....	9
Theoretical and Literature Review	9
2.1 Introduction	9
2.2 Health Information Systems	9
2.2.1 Components.....	10
2.2.2 Types.....	10
2.2.3 Health Information Systems in Saudi Arabia	11
2.3 Risk Management in Healthcare.....	11
2.3.1 Concept.....	11
2.3.2 Objectives	12
2.3.3 Frameworks	12
2.3.4 Risk Identification	13

2.3.5 Risk Assessment	13
2.4 Occupational Incidents in Emergency Departments.....	13
2.4.1 Types.....	14
2.4.2 Causes.....	14
2.4.3 Global Perspective.....	14
2.4.4 Saudi Perspective.....	15
2.5 Relationship between Health Information Systems and Risk Management.....	15
2.6 Health Information Systems and Occupational Incident Reduction.....	16
2.7 Theoretical Framework.....	21
2.8 Research Gap.....	22
2.9 Chapter Summary	22
CHAPTER THREE	23
Research Methodology	23
3.1 Introduction	23
3.2 Research Philosophy	23
3.3 Research Approach.....	24
3.4 Research Design	24
3.5 Study Population	25
3.6 Sampling Technique	25
3.7 Sample Size	26
3.8 Data Collection Method.....	26
3.9 Research Instrument	27
3.10 Validity and Reliability	29
3.11 Ethical Considerations	29
3.12 Data Analysis Techniques.....	30
Chapter Four.....	31
Findings	31
4.1. Introduction	31
4.2. Theme 1: Health Information Systems Strengthen Risk Management Practices	33
4.3. Theme 2: Electronic Reporting and Real-Time Information Improve Workplace Safety	35

4.4. Theme 3: Health Information Systems Contribute to the Reduction of Occupational Incidents	36
4.5. Theme 4: Organisational and Technical Factors Influence System Effectiveness.....	38
4.6. Theme 5: Operational Challenges Continue to Limit Effective Use of Health Information Systems	40
4.7. Theme 6: Training, Leadership, and System Usability Enhance User Adoption.....	42
4.8. Theme 7: Continuous Improvement Is Necessary to Maximise the Benefits of Health Information Systems.....	44
CHAPTER FIVE.....	49
Discussion and Conclusion.....	49
5.1 Introduction	49
5.2 Summary of Findings	49
5.3 Conclusions	51
5.4 Practical Implications	52
5.5 Recommendations	53
5.6 Recommendations for Future Research.....	54
5.7 Chapter Summary	54
References	56
Appendix A.....	60
Interview Transcription	60
Appendix B.....	66
Participant information sheet.....	66

List of Tables

Table 2.1. Summary Table of Literature Review	17
Table 3.1. Research Objectives and Interview Questions.....	28
Table 4.1. Coding Process Used to Develop Themes	32
Table 4.2. Framework analysis	46

List of Figures

Figure 4.1. Mindmap for Theme 1.....	35
Figure 4.2. Mindmap for Theme 2.....	36
Figure 4.3. Mindmap for Theme 3.....	38
Figure 4.4. Mindmap for Theme 4.....	40
Figure 4.5. Mindmap for Theme 5.....	42
Figure 4.6. Mindmap for Theme 6.....	44
Figure 4.7. Mindmap for Theme 7.....	46

Abstract

Health Information Systems (HIS) have become an integral part of modern healthcare by supporting risk management activities and improving workplace safety, particularly in emergency departments where healthcare professionals operate in high-risk environments. This study explored the effectiveness of Health Information Systems in supporting risk management programmes and reducing occupational incidents in Saudi hospitals. A qualitative research approach was adopted to gain an in-depth understanding of healthcare professionals' experiences and perceptions. Primary data were collected through semi-structured interviews with twelve healthcare professionals working in emergency departments, who were selected using purposive sampling. The interview data were analysed using thematic analysis to identify recurring themes and patterns. The findings revealed that Health Information Systems enhanced incident reporting, strengthened communication, improved decision-making, and supported the identification and monitoring of workplace risks. Another survey finding indicated that e-reporting systems helped enable timely interventions that led to a safe workplace and decreased on-the-job incident rates. Despite all of these benefits, there were certain obstacles that were found to hinder good utilization of HIS, such as technical problems, poor staff training, system integration problems, and the high workload. System-wide investment in digital infrastructure, staff capacity building, better system integration capabilities and greater organisation support are identified as key areas to be further capitalized upon for optimal HIS systems performance. The results contribute to the practical guidance of hospital administrators and policymakers to fortify occupational risk management in hospitals and improve worker safety in Saudi hospitals.

Keywords: Health Information Systems, Risk Management, Occupational Incidents, Emergency Departments, Saudi Hospitals

CHAPTER ONE

General Framework of the Research

1.1 Introduction

From local, regional, to national, and global levels, Health Information Systems (HIS) are being more and more identified as a key instrument to enhance quality, efficiency, and safety of healthcare services (Organization, 2024). Due to the fast development of information and communication technologies, healthcare delivery has completely changed, allowing health services organizations to gather, store, process, and share health-related information with electronic solutions. These include Electronic Health Records (EHRs), Clinical Decision Support Systems (CDSS), Hospital Information Systems (HIS) (Chae et al., 2011; Van Dort et al., 2021) Incident reporting systems and more, all of which help ensure timely access to accurate information for healthcare professionals. These technologies have proven critical for facilitating the clinical decision-making process, for better communications between professionals and for improving organisational performance. The hospital emergency department is one of the most challenging and complex areas in hospitals (Samadbeik et al., 2024). Emergency workers in healthcare facilities often face the risk of needlestick injuries, infectious disease exposure, violence, fall injuries, and work overload. Such occupational incidents could impact the health and wellbeing of healthcare workers and contribute to poor patient care, healthcare quality, and organisation efficiency. Therefore, an effective risk management program is an essential part of hospital management to identify, assess, monitor, and mitigate workplace risks. HIS have now been developed to be valuable tools in enhancing hospital risk management as they enable the capturing of real-time data, reporting of incidents, monitoring of risk, and evidence-based decision-making (Adeniji et al., 2023).

By providing timely access to clinical and administrative information, these systems enable healthcare organisations to identify potential risks, track safety indicators, and take preventive action that will lead to fewer occupational incidents. Furthermore, digital reporting systems encourage a culture of safety and enhance communication by allowing healthcare workers to make accurate and timely reports. Over the past few years, the healthcare industry in Saudi Arabia has undergone substantial digital transformation efforts compliant with Vision 2030 (Asem et al., 2024), where a tremendous amount of investment is placed in both electronic

health networks and electronic health technologies (EHTs) throughout hospitals in the public and private sectors. However, despite these advances, occupational health and safety issues remain in the ED, which may negatively impact health care service delivery. Thus, the measurement of the impact of the Health Information Systems on the existence and implementation of risk management programmes is becoming important (Gray et al., 2021). This study aims to investigate such a relationship in Saudi hospitals, which could then offer evidence for improving workplace safety, and to enhance the performance of ED in the Saudi Hospitals.

1.2 Background of the Study

Healthcare delivery is becoming more complex, prompting hospitals all over the world to ensure that their healthcare services are of ever-good quality, efficient, and safe, and use Health Information Systems as the strategic tool needed to meet these goals (Addo & Agyepong, 2024). In the last twenty years, there has been an epic shift in how healthcare systems are managed, moving from systems consisting of all paper records to an electronic support system that has multiple dimensions to it, such as clinical, administrative, and managerial. Modern Information Health (MIH) systems are used for secure management of health information, timely communication between healthcare professionals, and the development of capabilities to support decision-making, improving safe and effective healthcare delivery (Shojaei et al., 2024). Healthcare digitalisation is a key part of Saudi's Vision 2030 healthcare transformation initiative. The government has facilitated this by implementing rules and regulations to use Electronic Health Records, Hospital Information Systems, electronic incident reporting systems, etc. in healthcare setups.

The initiatives are focused on healthcare or operational issues such as: quality of care, patient safety, operational efficiency and evidence-based decision making across the healthcare system (Connor et al., 2023). Health Information Systems will increasingly be involved in supporting hospital organisations' "information risk management" as they are modernising their information infrastructure. The operational challenges that are faced in the ED are unique due to the many critically ill and injured patients they serve, the time constraint, and the unpredictable nature of the clinical situations. As such, these staff members face different occupational risks such as biological risk, physical injuries, violence in the workplace, fatigue, and psychological stress in the job. It can lead to staff shortages, lower productivity, a higher impact on health providers' budgets, and compromised outcomes for patients. Hence, hospitals

have created risk management schemes to pinpoint hazards, share experiences and put preventive measures in operation to reduce risks on the job. While HIS has the potential for delivering significant gains for work safety via incident reporting, risk monitoring, and data-driven decisions, there are some challenges such as system integration, user acceptance, staff training, interoperability, and data quality (Anioke & Atima, 2020). Moreover, the effectiveness of these systems in supporting risk management programmes and in minimising occupational incidents in emergency departments in Saudi Arabia is so far limited. The identified gaps require further research efforts to establish the impacts of using Health Information Systems for the provision of a safer working environment and better risk management practices in Saudi hospitals.

1.3 Literature Review (Brief Overview)

Health Information Systems (HIS) now play an essential role in an era of health care organizations that rely on the collection, management, and use of health care information for both clinical and administrative tasks (Haux, 2006). These range from Electronic Health Records, Clinical Decision Support Systems, Computerised Physician Order Entry systems, Laboratory Information Systems to electronic incident reporting systems. Evidence from previous research has consistently shown the benefits of successful implementation of Health Information Systems in enhancing quality of healthcare services, improving healthcare communication horizons, reducing medical error rates, and enhancing healthcare service delivery in an evidence-based clinical decision-making approach. Healthcare organisations have become even more reliant on digital technology, and the role of Health Information Systems is growing in many health-related contexts.

A considerable number of studies have also looked at the role of Health Information Systems in organisational risk management. Researchers have said digital information systems can help to identify potential risks, track safety parameters, accurately capture incidents, and help make timely corrective actions. Electronic incident reporting systems can enhance organisational learning by ensuring accurate data on adverse events and near misses are available, and decision-support technologies can help healthcare providers identify clinical risks before they lead to adverse events or injuries (Shaffi & Sidhick, 2025). For this reason, the utility of HISs for promoting a culture of safety in the organization and for enabling forward-looking risk management programs is increasingly recognized.

1.4 Research Problem

Emergency departments are amongst the most stressful and hazardous departments in hospitals, and exposure to infection, needlestick injuries, violence, slips and falls, and work-related fatigue are common workplace injuries (Reichard et al., 2017). Such occupational incidents pose a risk to the health and safety of healthcare workers and also impact healthcare costs, organisational performance, and quality of patient care. In response to these, hospitals increasingly have adopted Health Information Systems (HIS) to aid in risk management programmes, such as via clinical decisions, real-time tracking, and improved communication and electronic incident reporting (Atobatele et al., 2019). The Saudi government has invested in various initiatives aimed at health systems digitalisation, resulting in the widespread introduction of Health Information Systems in health institutions. Significant investment has been made in health systems digitalisation as per Saudi Arabia Vision 2030, and the technology of Health Information System (HIS) was largely introduced by health systems in Saudi Arabia.

Despite these technological advances, incident at work still happens in health care facilities, including the EDP, indicating that the adoption of HIS alone does not ensure good results for the risk management processes. These systems may affect risk reduction in the workplace due to the differences in system use, staff competence, cultures, interoperability, and reporting. In addition, although past studies have widely investigated the HIS applications in enhancing health services, patient health, and hospital organization efficiency, few empirical studies focus on the effectiveness of HIS applications in supporting risk management programs tailored to reduce occupational incidents faced by Emergency Department (ED) staff in Saudi hospitals (Torab-Miandoab et al., 2023). The absence of context-specific evidence falls short of supporting healthcare managers and policymakers in optimizing digital health technologies for optimizing occupational safety. For this reason, this study aims to explore the effectiveness of Health Information Systems in emergency departments of Saudi hospitals for occupational hazards reduction and risk management programme implementation.

1.5 Research Questions

This study seeks to answer the following research questions:

1. How effective are Health Information Systems in supporting risk management programmes in emergency departments of Saudi hospitals?
2. To what extent do Health Information Systems contribute to reducing occupational incidents among healthcare professionals working in emergency departments?

3. What are the key factors influencing the effectiveness of Health Information Systems in supporting occupational risk management?
4. What recommendations can be proposed to improve the utilisation of Health Information Systems for enhancing workplace safety and reducing occupational incidents in Saudi hospital emergency departments?

1.6 Research Objectives

The primary objective of this study is to evaluate the effectiveness of Health Information Systems in supporting risk management programmes and reducing occupational incidents in emergency departments of Saudi hospitals.

The specific objectives are:

1. To examine the effectiveness of Health Information Systems in supporting risk management programmes within emergency departments.
2. To assess the contribution of Health Information Systems to reducing occupational incidents among healthcare professionals.
3. To identify the factors that influence the effective utilisation of Health Information Systems in occupational risk management.
4. To provide evidence-based recommendations for improving Health Information Systems to strengthen workplace safety and risk management practices in Saudi hospitals.

1.7 Significance of the Study

This research study will be important theoretically and practically to the fields of healthcare management, health information systems, and occupational risk management. It is theoretically expected to extend the field of knowledge by studying the link between Health Information Systems, Risk Management programmes and the reduction of occupational incidents in emergency departments in Saudi hospitals. Previous research overwhelmingly studied issues of patient safety and healthcare quality, leaving a relatively poorly researched arena—occupational safety outcomes related to digital health technologies—to be explored in this research. From a practice point of view, the outcomes will be informative for hospital administration, health system workers, health information technology managers, and health policymakers dealing with the use and management of Health Information Systems. The study

will improve the understanding of strengths and weaknesses of current digital systems and identify recommendations for further development of a chain of incident reporting, risk identification, communication, and decision-making processes, all contributing to the achievement of a safer working environment. The study also has implications for the Saudi healthcare industry, which is also a strategic priority under Vision 2030 in its path for digital transformation. Healthcare organizations can benefit from understanding the role of Health Information Systems in occupational risk management, as it can help them improve the safety of their employees, minimize workplace accidents, boost organizational efficiency, and improve the quality of healthcare services. Finally, the findings could help develop policies for better risk management and help Saudi hospitals utilise digital health technologies better to increase safer and more resilient emergency department use.

1.8 Research Methodology Overview

For this study, the research method used is qualitative research, as it aims to identify the success of Health Information Systems (HIS) on the support it provides for the Saudi health risk management programmes and the reduction of occupational incidents within the Emergency Department of hospitals. Therefore, using a qualitative approach is appropriate as it allows for deeper insight into participants' experience, perceived risks, and beliefs about the management of workplace risks through the use of the Health Information Systems. It does not aim to quantify the role played by HIS in healthcare professions when dealing with occupational risks and safety, but tries to offer an insight into the perceptions of HIS contribution from the health care professionals' point of view. This study adopts an interpretivist perspective on research and understands reality as being socially constructed and that people's experiences and their interpretation of them give insight into organisational phenomena.

An inductive research approach is adopted to enable themes and patterns to emerge from the data without making any assumption about whether they exist. The study is a cross-sectional qualitative case study design with a focused study on the emergency departments (ED) used in Saudi hospitals with active usage of HIS. Primary data will be collected through semi-structured interviews conducted with healthcare professionals involved with emergency departments (E.D.) in the health service, such as physicians, nurses, risk management officers, health information specialists, and hospital administrators. The participants will be chosen through purposive sampling to capture those with pertinent knowledge and practical experience in Health Information Systems and hospital risk management only. Interviews will proceed until

data saturation; that is, the data collected from new interviews do not provide significant new themes. Thematic analysis will be used to analyse the interview data, which will be verbatim transcriptions of the interviews with informed consent of the participants. The following method will include familiarisation with the data, coding of meaningful statements, finding recurring themes, revisiting and updating themes, and interpreting the data in the light of research objectives and literature. Participants will be protected and the integrity of the study maintained by adhering to ethical principles such as informed consent, voluntary participation, anonymity, confidentiality and secure data storage throughout the research process.

1.10 Scope and Limitations

This study aims to scrutinize the effectiveness of HIS (Health Information Systems) in assisting risk management programmes and the decrease of incidental occupational hazards in the emergency departments of Saudi hospitals. The research is centered on the experiences and perceptions of the various healthcare professionals who routinely engage with Health Information Systems, such as physicians, nurses, risk management officers, health information specialists, and hospital administration officials. The data will be gathered by semi-structured interviews with the selected hospitals' participants in Saudi Arabia. The study looks into the role of HIS in the context of risk identification, incident reporting, communication, decision-making, and prevention of occupational incidents in the context of the emergency department. However, the study has several limitations. They are restricted to the setting of Emergency departments, and the results may not be generalisable to other hospital departments. Second, the results from this purposive sampling and qualitative research approach are likely to be more in-depth as to the participants' experience than statistical generalisations. Moreover, differences in the hospital's policies, technological infrastructure, as well as some differences in Health Information System implementation can affect the participants' perception and resulting study outcomes.

1.11 Structure of the Thesis

This thesis is organised into five chapters. **Chapter One** presents the general framework of the research, including the introduction, background of the study, literature review, research problem, research questions, hypotheses, research objectives, significance of the study, research methodology, scope and limitations, and the structure of the thesis. **Chapter Two** provides a comprehensive review of the theoretical and empirical literature related to Health Information

Systems, risk management programmes, and occupational incidents, and develops the conceptual framework. **Chapter Three** describes the research methodology, including the research philosophy, approach, design, participant selection, data collection procedures, ethical considerations, and thematic analysis. **Chapter Four** presents and discusses the findings obtained from the interview data. **Chapter Five** concludes the study by summarising the key findings, presenting the conclusions, discussing practical implications, offering recommendations, identifying study limitations, and suggesting directions for future research.

CHAPTER TWO

Theoretical and Literature Review

2.1 Introduction

Health Information Systems (HIS) play a significant role in the healthcare industry as they help efficiently handle clinical and administrative information in the system. Today, the health environment is becoming more and more complex, and digital information systems are a key asset for better care for the patient, clinical decision-making, operational efficiency, and health organisations' risk management. The right information must be available in a timely fashion in the ED, where operations are high risk and emergency care can be provided to critically ill patients. The theoretical and empirical literature supporting HIS, risk management in healthcare, and occupational incidents are reviewed. It also explores the utilization of Health Information Systems in Saudi Hospitals and pinpoints the lack of research required for the present study.

2.2 Health Information Systems

Health Information Systems (HIS): These are systems of technologies that are interwoven, integrated, and used to manage and flow information that is essential for clinical, administrative, economic, and managerial operations within healthcare organisations. World Health Organization (WHO) identifies Health Information Systems as the systems and structures that collect, process, analyse, and leverage health monitoring and health use data to guide decision-making and enhance support for health systems (Debie et al., 2024). HIS, in turn, is called a comprehensive information infrastructure, which can be used for patient information, clinical documentation, resource management, and organizational planning. Health Information Systems are the backbone of digital healthcare, providing accurate, real-time access to relevant information for diagnosis, treatment, patient monitoring, as well as organisational management. Modern HIS is better than conventional paper-based systems in that it allows care information to be made accessible, decreases duplication of records and documents, and cuts down on information documentation errors, in addition to facilitating coordinated healthcare services in different healthcare departments (AbouZahr & Boerma, 2005). These systems also provide valuable administrative data which can be utilized for quality of care, performance

measurement, regulatory compliance, and risk management purposes. Many of these systems have integrated patient engagement features, like birthdays and other specifics, to boost involvement.

2.2.1 Components

HIS will have multiple components which are interconnected to enable effective management of healthcare information. The hardware component consists of computer(s), servers, mobile devices, networking equipment, and data storage that allow the system to function. The functional requirements for patient records management, patient scheduling, lab services, pharmacy management, clinical decisions, and billing are all handled by software applications. The healthcare data itself, such as patient demographics, medical histories, laboratory readings, diagnostic images, medication history, and incident reports, is also a crucial part of a health record (Lau et al., 2010). Communication networks can be used for the safe transfer of information among departments or between healthcare establishments, supporting the seamless provision of healthcare services. Another important factor is human resources, such as healthcare professionals, health information specialists, IT-related personnel, and hospital administrators, who can impact how well the HIS is implemented; the competency and acceptance of the users (Goldschmidt, 2005). Additionally, policies, procedures, security protocols, and governance frameworks are in place to ensure that healthcare information is handled accurately, confidentially, and legally and ethically.

2.2.2 Types

Various kinds of Health Information Systems are employed by modern healthcare organisations for various functions in the healthcare organisations. Electronic Health Records (EHRs) offer a more unified, comprehensive, and digital history of a patient's health and treatment, offering health providers an easy way to access patient information. HIS combine administrative, financial, and operational processes with clinical processes into a single platform that facilitates working in tandem across hospital departments (Torab-Miandoab et al., 2023). CDSS can support healthcare professionals with evidence-based recommendations, medication alerts, diagnosis and treatment suggestions, and effectiveness of treatment assistance to foster improved decisions regarding care and reduce medical errors. Laboratory Information Systems are also used for laboratory testing processes, and Radiology Information Systems provide service and facilitate the reporting of imaging and diagnosis. Electronic Incident Reporting Systems allow healthcare employees to report adverse events, near misses, work injuries, or

workplace safety issues to aid organisational learning and continuous quality monitoring. Other systems that support healthcare management, like Pharmacy Information Systems, Nursing Information Systems, and Human Resource Information Systems, thus far, help in the general performance.

2.2.3 Health Information Systems in Saudi Arabia

As a part of Saudi Arabia's Vision 2030 and the Health Sector Transformation Programme, the country has made great strides in digitalising healthcare. The Ministry of Health has focused on introducing IHiS to enhance the quality of health services, efficiency of operations, patient safety, evidence-based decision-making, and more. Electronic Health Records, Hospital Information Systems, telemedicine platforms and electronic incident reporting systems are among the new technologies that have been increasingly used by public and private hospitals in modernizing the delivery of health services (Altuwaijri, 2008). Through the National Transformation Programme, health services proceeding towards digitalization have been further boosted, with the achievement of interoperability between healthcare institutions, electronic offering of health services, and advancing the governance of health information. These developments have been especially beneficial in emergency departments with enhanced patient registration, electronic triage, quick access to clinical data, and more effective communication in a multidisciplinary approach to patients. Despite these developments, some of the factors are still limiting the use of HIS in Saudi hospitals (Alharbi, 2018). These range from system integration, technical infrastructure, user training, organisational readiness, and interoperability of the healthcare institutes. There are also types of healthcare professionals who may be skeptical of technology or have challenges with incorporating new digital processes. In this regard, the impact of Health Information Systems on the risk management of healthcare organizations and health consequences to the employees' lives is still a vital field of study for the context of Saudi healthcare.

2.3 Risk Management in Healthcare

2.3.1 Concept

Healthcare Risk Management is the systematic process of identifying, analysing, evaluating, controlling and monitoring risks, which may impact patients, healthcare professionals, guests, the company's assets and healthcare operations. It aims to reduce the risk of negative outcomes and ensure high-quality and safe healthcare delivery (Khalifa, 2013). Effective risk

management is critical for patient safety and staff success within healthcare organisations that work in environments of uncertainty, complex clinical processes, evolving patient needs, emergency departments and technological reliance. Risk management doesn't just involve mitigating adverse events; how it should truly be used is by taking a proactive approach and preventing potential hazards from negatively impacting patient care (Alsalman et al., 2021). Risk management is now increasingly implemented into the governance systems of modern healthcare organisations, quality control and improvement systems, and strategic decision-making, all in an attempt to make healthcare organisations more resilient and improve continuous improvement efforts.

2.3.2 Objectives

The main goal of health care risk management is to safeguard patients, health care staff and health care organizations from avoidable injury. Good risk management aims to eliminate medical errors, minimise occupational injuries to employees, maximize patient safety, enhance organizational performance, and make sure legal, regulatory and accreditation requirements are met. It also benefits optimum utilization of resources (minimizes the financial loss due to adverse events) and establishes public confidence in the health care service (Khalifa, 2014). A standard use of risk management, or accident prevention, measures in an ED is to establish a safer working practice by risk and hazard identification, improving incident reporting systems and implementing preventive measures, and promoting a culture of safety. These objectives are important not only for protecting health care workers, but they are also important to promote quality and continuity of patient care.

2.3.3 Frameworks

Several renowned initiatives surround risk management practices in health facilities. The ISO 31000 Risk Management Framework is the most commonly-used and used framework that outlines the principles and processes to be followed on the ways and means to identify, analyse, evaluate, treat, monitor and communicate risks. ERM (Enterprise Risk Management) is also part of the toolkit of healthcare institutions, designed to incorporate strategic, operational, financial, technological and clinical risks into organisational governance. Clinical governance mechanisms also support risk management by encouraging accountability, ongoing quality monitoring, patient safety, staff learning and teaching, and evidence-based practice. These frameworks go beyond incident reporting by requiring healthcare organisations to have a

system in place for measuring performance, learning from the incident and taking steps to reduce future risks and identify corrective actions.

2.3.4 Risk Identification

Risk identification is the first step in the operational phase of the risk management process, which is identifying hazards that could pose a threat to organisational goals, or put the patient or staff at risk. Biological hazards, medication errors, equipment failure, violence in the workplace, miscommunication between staff, staff fatigue, ED crowding, and poor infection control measures are issues that can present risks for patients in Emergency departments. Healthcare organisations use various methods to predict risks, such as incident reporting systems, Safety audits, Workplace inspections, Root cause analysis, Staff feedback, Clinical observations, and performance monitoring. HIS has extremely simplified the process of risk identification through electronic reporting, providing report documentation in real time, trend analysis, and also cross-departmental data sharing.

2.3.5 Risk Assessment

After the risks have been identified, healthcare organisations will be able to carry out risk assessments to assess the nature and magnitude of identified risks (DeRosier et al., 2002). Risk assessment will help decision makers prioritise hazards by their impact and provide a basis for effective resource allocation when dealing with high-priority hazards. This is often performed by means of a Risk matrix, a probability-impact analysis, a Failure Mode and Effects Analysis (FMEA), and a Root Cause Analysis (RCA) (Yucel et al., 2012). Health Information Systems improve risk assessment by delivering complete, accurate, and timely data to organisations that inform the use of evidence to inform decision-making. Electronic dashboards, incident databases and performance indicators can provide healthcare managers with information on trends, assess and analyze how well the current controls are working, and plan for specific actions. In emergency departments, systematic risk assessment can help to minimise work incidents, increase organisational resilience and establish a proactive culture of safety.

2.4 Occupational Incidents in Emergency Departments

Emergency Departments (Emergency departments) are one of the most challenging and risky areas of health service delivery in health service organisations. Patients are often both severely ill and injured, and health care professionals in these environments experience unusual

circumstances where working in pressured time and workload and unpredictable clinical situations is commonplace. As a result, health workers attending ED are subject to several risks to their physical and mental health and wellbeing. Healthcare workers are not only at risk for occupational injuries, but patient safety, organisational efficiency, and healthcare costs will be lowered. It is therefore crucial to understand what they are about and what may trigger them, to be able to design efficient risk management strategies.

2.4.1 Types

Workplace incidents include all types of workplace injuries and safety incidents attended by an emergency department. Hazards often seen include patient handling-related musculoskeletal injuries, medication preparation accidents, chemical exposure, equipment-related injuries, exposure to bloodborne pathogens and infectious diseases, and slips, trips and falls which occur when individuals are moving about (Lundstrom et al., 2023). Healthcare workers often suffer from violence in the workplace, either from patients or visitors, including verbal abuse, physical assault and aggressive behaviour. The nature of emergency care is also increasingly making Psychological hazards like stress, burnout, fatigue, anxiety and emotional exhaustion more commonplace.

2.4.2 Causes

There are several organisational, environmental and human factors which contribute to occupational incidents in Emergency departments. Fatigue among healthcare workers, from high patient volume & overcrowding, long work hours, staff shortages & high workload, reduces safe practice. Breakdowns in communication between multi-disciplinary teams can lead to errors in the clinical setting and an unsafe working environment (Maguire et al., 2005). Poor working practices, insufficient training, lack of safety awareness, failure to follow-up on infection control measures, equipment fault and poor workplace design add to the work risks. Some organisational aspects like ineffective reporting systems, limited safety culture and a lack of effective risk management programmes also impedes the identification and prevention of workplace hazards.

2.4.3 Global Perspective

Healthcare workers continue to have an occupational health problem that is a global issue. Healthcare workers are one of the professions most often exposed to biological, physical,

chemical, ergonomic and psychosocial risks, as recognised by International Organisations such as the World Health Organisations (WHO) and the International Labour Organisations (ILO) (Mohanty et al., 2019). Research nationally and internationally indicates that emergency department workers are high risk for needlestick injuries, occupational violence, musculoskeletal disorders, and stress. Workplace hazards have ramped up even more as healthcare delivery has become more complex, emerging infectious diseases have reached unprecedented levels, and patient expectations have grown. This rise in complexity of healthcare delivery and the threat of emerging infectious diseases as well as the increased expectations for patient care has gone further and strengthened the occupational safety programmes and digital technologies in healthcare organisations around the world to support timely risks.

2.4.4 Saudi Perspective

In Saudi Arabia, safety and wellbeing in the workplace are a crucial priority in the healthcare sector, as part of the Vision2030 transformation efforts implemented for the country. Saudi hospitals have made a huge investment in this area as they applied Health Information Systems, Electronic Incident Reporting Systems (EIRS), Infection Control Programs, and comprehensive Risk Management Programs. However, biological exposure, workplace violence, high workload, and a stressful workplace continue to be confirmed as occupational incidents for healthcare professionals attending ED services (Taskingul et al., 2024). Different healthcare organisations continue to affect occupational safety outcomes due to different organisational culture, staff training, reporting, and technological integration, etc. Therefore, it is getting more importance to explore the potential of incorporating HIS to enhance the implementation of health risk management programmes and reduce the occurrence of potential work-related hazards in hospital emergency rooms in Saudi Arabia.

2.5 Relationship between Health Information Systems and Risk Management

Health Information Systems (HIS) have emerged as a key instrument of enhancing risk management in a healthcare setting because of their capability to collect, analyse, and disseminate healthcare information. Information is a critical component of risk management, and its quality, accuracy, and completeness are fundamental to identifying hazards, evaluating risks, and monitoring safety performance and intervening appropriately. These were typically paper-based, making information hard to find and prone to documentation mistakes; traditional

processes that constrained the effectiveness of these activities. With the implementation of integrated Health Information Systems, an organisation's ability to proactively manage risk has been greatly improved (Runciman et al., 2006).

Improving incident reporting processes is one of the main ways that HIS contributes to risk management. Electronic reporting systems allow health care professionals to report adverse events, near misses, occupational injuries, and safety issues promptly and accurately. Digital reporting ensures that information is promptly available, reduces incomplete records, and empowers healthcare managers to spot trends and opportunities that need organisational attention. These systems also promote transparency and organisational learning through the development of a comprehensive database for continuous quality improvement (Heeks, 2006). Health Information Systems also play a role in enhancing risk management by supporting real-time monitoring and surveillance. Clinical dashboards, automated alerts, and performance indicators allow healthcare managers to keep track of patient safety events, infection rates, staff injuries, equipment failures, and operational risks. By identifying potential threats early on, hospitals can take action to prevent them from becoming serious adverse events. Decision-support technologies also help healthcare workers with clinical alerts, treatment suggestions, medication safety checks, and standardised procedures, decreasing the risk of human mistakes.

Another key benefit of HIS is the enhanced communication and coordination among healthcare providers. Integrated electronic records facilitate efficient exchange of patient data among multidisciplinary teams, minimizing communication gaps that could pose risks or challenges for the worker or patient. In addition, Health Information Systems enable organisations to be held accountable with accurate information for performance evaluation, regulatory compliance, accreditation and strategic planning. In conclusion, the literature indicates that HIS has the potential to enhance healthcare risk management by providing evidence-based decision making, safety culture, incident reporting and ongoing monitoring of risks in the organisation. (Phillips et al., 2014).

2.6 Health Information Systems and Occupational Incident Reduction

One of the key ways that Health Information Systems can contribute to reducing occupational incidents is by facilitating healthcare organisations to take proactive measures in the workplace. Electronic information systems make identification, reporting, monitoring, and analysis of

occupational hazards easier, enabling timely preventive measures by hospital administrators. But rather than simply reacting to incidents, healthcare organisations can use digital information to anticipate potential risks and plan accordingly to reduce workplace injuries.

Electronic incident reporting systems are especially helpful when it comes to occupational incidents, as they promote prompt reporting of occupational injuries, near misses, workplace violence, and infection exposures by healthcare workers. Having precise data on incidents makes it easier for risk management teams to see patterns in incidents, perform root cause analyses, and take specific steps to fix issues. Clinical Decision Support Systems also play a role by offering safety alerts, infection control reminders, medication warnings, and evidence-based guidelines that minimize clinical errors and occupational exposures. (Strawbridge et al., 2011).

Another benefit of Health Information Systems is better communication between departments, allowing for the efficient sharing of safety information among healthcare professionals, managers, and risk management teams. Having a built-in safety data system helps staff to learn more about safety, contributes to occupational health compliance, and enhances organisational safety culture. Timely and accurate information is a major factor in preventing occupational injuries and safe working situations, especially in emergency departments where decisions and teamwork are critical and need to be made quickly.

While most studies have found a positive correlation between HIS and occupational safety, the effectiveness relies on many organizational aspects such as user training, system usability, leadership support, technological infrastructure, interoperability, and acceptance by employees. So, as well as advanced digital technologies, organisational commitment to continuous improvement and good risk management practices is key to successful implementation. These considerations reinforce the need to look at the effectiveness of Health Information Systems (HIS) in reducing occupational incidents specifically in Saudi Emergency departments (Florez-Salas et al., 2023).

Table 2.1. Summary Table of Literature Review

Author(s)	Findings	Research Gap	Contribution of This Study
AbouZahr & Boerma (2005)	HIS provides accessible, coordinated care information, reduces documentation errors and duplication, and supports	Did not specifically examine HIS effectiveness for occupational incident	Investigates how HIS accessibility features impact occupational safety in Saudi EDs

	quality care across healthcare departments	reduction in emergency settings	
Lau et al. (2010)	Healthcare data is a crucial component of HIS, including patient demographics, medical histories, laboratory results, and incident reports	Focused primarily on clinical data management rather than risk management applications	Examines the role of incident reporting data within HIS for occupational risk management
Goldschmidt (2005)	Human resources and user competency significantly impact HIS implementation success	Did not address the relationship between user acceptance and occupational safety outcomes	Explores healthcare professional perspectives on HIS effectiveness for workplace safety
Torab-Miandoab et al. (2023)	EHRs, CDSS, and integrated HIS platforms facilitate care coordination and clinical decision-making	Did not examine the potential of these systems for occupational incident prevention	Evaluates specific HIS types (EIRS, CDSS) for reducing workplace incidents in EDs
Altuwaijri (2008)	Saudi hospitals increasingly adopting EHRs, HIS, telemedicine, and EIRS under Vision 2030	Limited empirical evidence on HIS effectiveness in Saudi emergency departments	Provides empirical data from Saudi ED healthcare professionals on HIS risk management impact
Alharbi (2018)	Identified barriers to HIS implementation in Saudi hospitals including system integration, infrastructure, training, and interoperability	Did not specifically address how these barriers affect occupational safety outcomes	Investigates how implementation challenges influence HIS effectiveness for risk management
Khalifa (2013)	Healthcare risk management is a systematic process aimed	Focused on risk management concepts	Examines the specific role of HIS in supporting

	at reducing negative outcomes and ensuring quality care	without exploring HIS integration	comprehensive risk management programs
Alsalman et al. (2021)	Effective risk management requires proactive hazard prevention rather than reactive mitigation	Did not address technology's role in proactive risk identification and prevention	Evaluates how HIS enables proactive occupational hazard identification and prevention
DeRosier et al. (2002)	Risk assessment involves evaluating identified risks using tools like FMEA and RCA	Did not link risk assessment tools to HIS capabilities	Assesses how HIS data analytics supports systematic risk assessment in EDs
Yucel et al. (2012)	Risk matrices and probability-impact analysis help prioritize hazards for resource allocation	Did not examine digital tools for risk assessment implementation	Investigates electronic dashboards and data analytics for evidence-based risk assessment
Lundstrom et al. (2023)	Common occupational hazards include musculoskeletal injuries, medication errors, chemical exposure, and bloodborne pathogen exposure	Did not explore technology's role in mitigating these specific hazards	Evaluates HIS effectiveness in monitoring and reducing specific occupational incident types
Maguire et al. (2005)	Communication breakdowns, fatigue, and staffing shortages contribute to occupational incidents	Did not address how HIS improves communication and reduces human factors	Examines HIS role in improving communication and reducing human error-related incidents
Mohanty et al. (2019)	WHO and ILO recognize healthcare workers as high-risk for biological,	Global perspective without specific Saudi context	Focuses specifically on Saudi ED healthcare workers

	physical, chemical, and psychosocial hazards		and their occupational safety experiences
Taskingul et al. (2024)	Saudi hospitals continue to face occupational incidents including biological exposure, violence, and high workload despite investments	Did not evaluate HIS effectiveness in addressing these persistent issues	Assesses how HIS interventions impact occupational incident rates in Saudi EDs
Runciman et al. (2006)	Integrated HIS significantly improves organizational ability to proactively manage risk	Did not specifically examine occupational risk management applications	Focuses specifically on occupational incident reduction through HIS integration
Heeks (2006)	Digital reporting systems enhance transparency and organizational learning through comprehensive databases	Did not evaluate contextual factors affecting HIS success in risk management	Examines organizational factors affecting HIS risk management effectiveness in Saudi EDs
Phillips et al. (2014)	HIS supports evidence-based decision-making, safety culture, and ongoing risk monitoring	Did not investigate healthcare professional perceptions of HIS effectiveness	Captures healthcare professional perspectives on HIS risk management benefits
Strawbridge et al. (2011)	CDSS provides safety alerts and evidence-based guidelines that minimize clinical errors and occupational exposures	Did not evaluate CDSS effectiveness specifically in ED occupational safety	Evaluates CDSS and other HIS tools for occupational incident prevention in EDs
Florez-Salas et al. (2023)	HIS effectiveness depends on user training, system	Did not specifically address Saudi healthcare context or	Addresses contextual factors affecting HIS

	usability, leadership support, and infrastructure	emergency departments	effectiveness in Saudi EDs
Trist (1981); Trist et al. (1960)	STS Theory: organizations perform best when technical and social systems are aligned	Theory not previously applied to HIS and occupational safety in Saudi EDs	Applies STS Theory framework to understand HIS-occupational safety relationships in Saudi EDs

2.7 Theoretical Framework

The Socio-Technical Systems (STS) Theory underpins this study to provide an appropriate framework to examine the effectiveness of Health Information Systems (HIS) in supporting risk management programmes for reducing occupational incidents in emergency departments. Developed by the Tavistock Institute, STS theory suggests that organisations perform best when their technical system (technology, tools and processes) and social system (people, organisational culture, communication and work practices) are aligned. Instead of technology as a separate solution, the theory focuses on how technological systems and human behaviour come together to accomplish an organisation's goals. (Trist, 1981).

In healthcare, Health Information Systems are the technical subsystem that supports healthcare practitioners with electronic health records, incident reporting systems, decision support tools, communication systems, and so on that enable clinical and administrative operations. The social subsystem includes the healthcare professionals, management, organizational policies, teamwork, leadership, and workplace culture that impact the use of these technologies. STS Theory states that the effective use of Risk Management and Occupational Safety is not only reliant on the presence of advanced Health Information Systems, but also upon the capacity of health care workers to effectively utilize these systems in supportive organisational settings. Therefore, the theory would be suitable to view the interaction between technology and organisational factors to achieve a safer workplace and better risk management in Saudi hospital emergency departments (Trist et al., 1960).

2.8 Research Gap

In past research, there has been a lot of exploration regarding the contribution of Health Information Systems in enhancing the quality of healthcare, patient safety, operational efficiency, and clinical decision-making. But there is comparatively little research on their effectiveness for particular risk management programmes for occupational incidents of healthcare workers in emergency departments. Moreover, there is limited empirical evidence in the Saudi healthcare context, which has significant investments in the healthcare digital transformation under Vision 2030. This study aims to fill this gap by investigating the perspectives of healthcare professionals regarding the role of HIS in risk management toward occupational safety in Saudi hospitals' Emergency departments.

2.9 Chapter Summary

The theoretical and empirical literature pertinent to this study was covered in this chapter. It was about the Health Information Systems (HIS) concept, components, and types, and how they are implemented in Saudi hospitals. Healthcare risk management, occupational incidents in emergency departments, and the linkage between Health Information Systems, risk management, and occupational safety were also explored. In addition, the Socio-Technical Systems Theory was introduced as the theoretical underpinning for the research, and the current research gap was identified. The next chapter outlines the methodology used in the study to explore the impact of HIS on risk management programmes at Saudi hospital Emergency departments.

CHAPTER THREE

Research Methodology

3.1 Introduction

The methodology used in this research is described in this chapter, which was an exploratory study to investigate the effectiveness of Health Information Systems (HIS) in supporting risk management programmes and reducing occupational incidents in emergency departments (ED) of Saudi hospitals. It provided background on the philosophical assumptions, research approach, and research design of the study to tackle the research objectives. The chapter included procedures for participant selection, data collection, data analysis, as well as steps taken to ensure trustworthiness and ethical compliance in the research. These methodological decisions were made to enable the exploration of the experiences and perceptions of healthcare professionals on the role of Health Information Systems in occupational safety and risk management in the Saudi healthcare context in depth.

3.2 Research Philosophy

The research was done using the interpretivist approach to research. Interpretivism was viewed as suitable as the research aimed to gain insight into health care professionals' experiences, perceptions and interpretations of the effectiveness of the HIS in supporting risk management programmes and reducing occupational incidents. Interpretivism philosophy did not presume that reality could be objectively measured, but rather that people created meaning from their experiences in their organisational and professional context.

This philosophy allowed the researcher to gain a deeper insight into participants' views and how Health Information Systems were seen and used in Emergency departments. The interpretivist perspective also found that the attitudes of the participants regarding risk management and occupational safety were shaped by the organisation's practices, workplace culture and personal experiences. Accordingly, this philosophical approach offered an appropriate base for developing rich qualitative insights which would not have been achieved exclusively by quantitative approaches (Alharahsheh & Pius, 2020).

3.3 Research Approach

The study was conducted using an inductive research method. The inductive approach was chosen as the research aimed to gain an understanding of the effectiveness of Health Information Systems from the experience and opinion of the healthcare professionals rather than testing predetermined theory relationships. This was to avoid the imposition of a priori assumptions prior to data collection and the emergence of patterns, themes and concepts from the collected data.

The inductive approach was suitable, especially for qualitative research, to be able to explore participants' perspectives about the role of Health Information Systems for organisational risk management and reduction of occupational incidents. The results generated from the interviews were analysed systematically, and the recurring themes were highlighted that resonated with the participants' experiences in the Saudi hospital emergency room. These themes were then later analysed in relation to literature and the theoretical framework of this study to produce meaningful conclusions (Hayes et al., 2010).

3.4 Research Design

The research design used in this study was a qualitative approach adopted as a primary design to explore the effectiveness of Health Information Systems (HIS) to support risk management programmes to reduce occupational incidents in emergency departments of Saudi hospitals. The study was designed qualitatively as the intention was to find rich and detailed information from health care professionals' experiences, perceptions, and opinions about Health Information Systems in the workplace. This allowed the researcher to delve into the thoughts and views of the participants and not execute measurements through numerical data.

Primary data was gathered from the respondents using the method of semi-structured interview technique. The interview method was chosen as it gave the participants the flexibility to express their own experiences and enabled the interviewer to ask further questions to clarify and explore significant issues. This led to an in-depth analysis of how HIS had affected risk management activities, occupational safety practices, and how it contributed to reducing workplace incidents in ED (Adeoye-Olatunde & Olenik, 2021). The qualitative research design also enabled the participants to express their thoughts in relation to organizational practices, technological challenges, and factors that influence the effective use of HIS. The interview data offered detailed contextual information not possible with structured questionnaires. Overall, the main data collection method (qualitative interview) was suitable to meet the research objectives and

provide in-depth evidence about the role of Health Information Systems in strengthening the risk management programmes and improving occupational safety in Saudi hospital emergency departments (Karatsareas, 2022).

3.5 Study Population

Healthcare professionals (HCP) in the emergency departments of selected hospitals in Saudi Arabia constituted the study population. Those who were directly involved in patient care, hospital operations, risk management activities, or implementation and utilization of Health Information Systems (HIS) were targeted. Participants were emergency physicians, nurses, risk management officers, health information specialists, and hospital managers with relevant knowledge and experience on the use of Health Information Systems in the context of workplace safety and risk management programmes.

These participants were judged as appropriate due to their frequent interaction with Health Information Systems and being directly involved in the identification, reporting, monitoring, or management of occupational risks in emergency departments. Their work experiences helped them to offer insights on how digital health technologies can be used to enhance safety practices and to prevent occupational incidents. So, having participants who had firsthand interaction with Health Information Systems ensured that the study would produce rich and relevant qualitative data that could help in achieving the study objectives.

3.6 Sampling Technique

Purposive sampling was used in this study, which included individuals with knowledge and experience in the application of Health Information Systems in the ED of Saudi hospitals. The researcher found that the use of purposive sampling was found to be appropriate, as qualitative research is not interested in statistically representative samples but in information-rich ones that are likely to provide detailed information about the phenomenon under study. The use of this technique allowed the researcher to be selective in finding those who are directly involved in the use of Health Information Systems and also involved in the risk management activities of the hospital.

Participants were chosen according to the inclusion criteria set. Participants were all healthcare professionals working in emergency departments of the Saudi hospitals and who were familiar with using Health Information Systems for their daily activities. These included EPs, nurses, risk management officers, health information specialists, and hospital administrators. Those

who were not experienced in the use of Health Information Systems or who did not work in the emergency department were excluded from the study.

The number of participants was based on the principle of data saturation, which means that the interviews were continued until no new themes, concepts or meaningful narratives were gained from the data. This allowed the data to be gathered to be both wide and deep enough to address the research questions as would be appropriate in qualitative research. Thus, the purposive sampling method was used to provide credible, relevant, and experience-based views of the effectiveness of the use of Health Information Systems to support risk management programmes and reduce occupational incidents in the EMU in Saudi hospitals (Campbell et al., 2020).

3.7 Sample Size

The sample size was not statistically calculated, but was determined by data saturation, a characteristic of qualitative research. The saturation of data was determined when no further themes, concepts, or meaningful data emerged from further interviews relevant to the study aims. This made sure that the data obtained were rich and comprehensive enough to give an in-depth understanding of the effectiveness of HISs in the support of risk management programmes and the reduction of occupational incidents.

In total, approximately 12 healthcare professionals were interviewed, such as an emergency physician, nurse, risk management officer, health information specialist and hospital administrators. The researcher believed that this was a good sample size for qualitative interview research as it allowed sufficient depth and diversity in data collection and analysis.

3.8 Data Collection Method

Semi-structured interviews were conducted with healthcare professionals (HCP) in emergency departments (ED) of selected hospitals in Saudi Arabia to gather primary data. A semi-structured interview was deemed the most suitable data collection tool as it allowed the researcher to gain insight into how Health Information Systems can support risk management programmes and reduce occupational incidents from the participants in terms of experience, opinion, and perception. Semi-structured interviews were flexible enough for the participants to give detailed answers to the questions posed, and the researcher was able to pursue questions when necessary.

An interview guide was created based on research objectives and literature. The guide included open-ended questions related to their experience with HIS, how the HIS supports their work in risk management, experience with reporting OIs, perceived advantages and disadvantages of implementing HIS, and suggestions for improving workplace safety using digital systems. The interview guide provided some uniformity among interviews, but participants were allowed to discuss the issues at hand in any detail they saw fit.

Before taking part in each of the interviews, participants were told the purpose of the study and their voluntary participation. Before beginning the interviews, informed consent was obtained. With participants' permission, all interviews were audio-recorded to ensure the accuracy of the collected data. The recordings were then transcribed verbatim for detailed analysis. Through this method, the researcher was able to collect broad-based qualitative data relevant to the research questions and objectives.

3.9 Research Instrument

The main research instrument used in this study was a semi-structured interview guide for the research objectives. The interview guide was developed after a thorough examination of the literature on Health Information Systems, healthcare risk management, and occupational safety. It ensured that all participants were asked similar questions and allowed adequate flexibility to pursue issues in greater depth, depending on the participants' responses.

The interview guide was comprised primarily of open-ended questions that were grouped into sections. The first section was professional background information, such as the participant's role, number of years they had worked, and whether they were involved in Health Information Systems. The second part examined participants' experience of the implementation and use of HIS in Emergency departments. The third section investigated the role of these systems in supporting risk management activities such as incident reporting, communication, monitoring, and decision-making. The last part explored the participants' opinion about the effectiveness of HIS in preventing occupational incidents, as well as the problems faced and suggestions for the future.

The interview guide was used as a guide and not as a questionnaire. Where necessary, the researcher used probing questions to get explanations and clarify the participants' responses and adapted the sequence of questions. This way, broad and relevant information was gathered, and participants could discuss points they felt important to their organisational context.

Table 3.1. Research Objectives and Interview Questions

Research Objective (RO)	Semi-Structured Interview Questions
RO1: To examine the effectiveness of Health Information Systems in supporting risk management programmes within emergency departments.	Q1. How do Health Information Systems support risk management activities in your emergency department? Q2. In your experience, which features of the Health Information System are most useful for identifying and managing workplace risks? Q3. How effective do you believe the current Health Information System is in supporting risk management programmes?
RO2: To assess the contribution of Health Information Systems to reducing occupational incidents among healthcare professionals.	Q4. How has the use of Health Information Systems influenced the reporting and management of occupational incidents in your department? Q5. Can you describe any ways in which the Health Information System has helped prevent workplace injuries or safety incidents? Q6. Have you observed any improvements in occupational safety since the implementation of the Health Information System? Please explain.
RO3: To identify the factors that influence the effective utilisation of Health Information Systems in occupational risk management.	Q7. What factors facilitate the effective use of Health Information Systems for managing occupational risks? Q8. What challenges or barriers affect the effective use of Health Information Systems in your emergency department? Q9. How do staff training, organisational support, or system usability influence the effectiveness of the Health Information System?

RO4: To provide evidence-based recommendations for improving Health Information Systems to strengthen workplace safety and risk management practices in Saudi hospitals.	Q10. What improvements would you recommend to enhance the effectiveness of Health Information Systems in supporting risk management? Q11. What organisational changes could improve the use of Health Information Systems for occupational safety? Q12. What recommendations would you offer to hospital management or policymakers for strengthening workplace safety through Health Information Systems?
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3.10 Validity and Reliability

Validity and reliability are usually dealt with in qualitative research through the notions of credibility, dependability, transferability and confirmability. The questions for the interview were designed from literature and in line with the research objectives with a view of giving the interview a degree of credibility. The participants were chosen for having first-hand experience in Health Information Systems and Hospital risk management; therefore, the study yielded relevant and reliable information.

The dependability was ensured by using the same procedure in conducting the interview and making records of each step of the research. The interview recordings were transcribed verbatim to ensure the accuracy of participants' responses. Confirmability was achieved by ensuring that the interpretation of the findings was done based on the interview data and not on any personal assumptions of the researcher. These measures combined made the study results more credible and of higher quality.

3.11 Ethical Considerations

The ethical principles were taken care of throughout the research process. The participants were informed about the goal of the study and their rights before the interviews. All participants provided informed consent, and their involvement was completely voluntary. The participants were told they were free to leave the research at any time with no repercussions. Any personal identifiers were removed from the interview transcripts, and confidentiality and anonymity

were maintained, while the data collected were stored and used only for academic research purposes.

3.12 Data Analysis Techniques

Thematic analysis was used to analyse the interview data. After transcription, the researcher read each interview transcript to get acquainted with the data. Initial codes were assigned to meaningful statements and then categorized into general codes that were similar. These categories were then translated to themes that illustrate participants' experiences and perceptions about the impact of HIS on the effectiveness of risk management programmes, and on the reduction of occupational incidents. The identified themes were interpreted according to the research objectives, the theoretical framework and existing literature, and meaningful conclusions were drawn.

Chapter Four

Findings

4.1. Introduction

Twelve of the twelve participants were interviewed, and data were analysed using thematic analysis to identify the shared experiences, meaning, and patterns that appeared in the data regarding the effectiveness of Health Information Systems (HIS) in supporting risk management programmes and reducing occupational incidents in emergency departments of Saudi hospitals. A thematic analysis was chosen as it offers a systematic and flexible method of analysing qualitative data to allow the researcher to identify, organise, and interpret meaningful themes that arose from the participants' responses.

Based on the six-phase analysis framework by Braun and Clarke (2006), the analysis was conducted. All the recordings of the interviews were first transcribed verbatim and then looked through a few times to familiarize oneself with the data. At this stage, the researcher carefully explored and analyzed the responses to understand the experiences and attitudes of the participants towards Health Information Systems and workplace safety. The second step was to create the preliminary codes based on the interview transcripts, where significant statements, recurrent ideas, and meaningful expressions were identified. These similar codes were then clustered into overarching themes, according to their conceptual similarity.

In the second phase, these categories were explored and further elaborated to form coherent themes that captured the participants' common experiences. Each theme was examined to verify that it captured the data content and met the research aims. Key quotes from the participants were then chosen to illustrate each theme and to act as evidence for the findings. To ensure confidentiality and anonymity of participants throughout the reporting process, participants were identified by the pseudonyms R1–R12.

The analysis led to the seven major themes: (1) Health Information Systems Strengthen Risk Management Practices; (2) Electronic Reporting and Real-Time Information Improve Workplace Safety; (3) Health Information Systems Contribute to the Reduction of Occupational Incidents; (4) Organisational and Technical Factors Influence System Effectiveness; (5) Operational Challenges Continue to Limit Effective Use of Health Information Systems;

(6) Training, Leadership, and System Usability Enhance User Adoption; (7) Continuous Improvement Is Essential for Maximising the Benefits of Health Information Systems. These themes in aggregate offer a holistic picture of the impact of HISs on ORM and safety in Saudi hospitals.

Table 4.1. Coding Process Used to Develop Themes

Participant Quote	Initial Code	Focused Code	Category	Final Theme
"The system helps us report incidents quickly."	Quick reporting	Electronic incident reporting	Incident reporting	Theme 1
"It improves communication between departments."	Better communication	Information sharing	Communication	Theme 1
"Real-time alerts help us respond quickly."	Real-time alerts	Immediate response	Real-time information	Theme 2
"The system allows us to access information immediately."	Fast information access	Information availability	Clinical information	Theme 2
"The system alerts us to potential risks."	Early warning	Risk prevention	Preventive safety	Theme 3
"Better patient information helps us avoid mistakes."	Reduced errors	Clinical safety	Occupational safety	Theme 3
"Regular staff training makes the system easier to use."	Staff training	User competence	Training	Theme 4
"Support from hospital management improves implementation."	Leadership support	Organisational support	Management commitment	Theme 4
"Sometimes the system is slow."	Slow system	Technical issue	Technical barriers	Theme 5
"Heavy workloads leave little time for reporting."	Workload	Time pressure	Operational barriers	Theme 5

"Proper training gives staff more confidence."	User confidence	Training effectiveness	User adoption	Theme 6
"Supportive leadership promotes compliance."	Leadership	Leadership encouragement	Organisational support	Theme 6
"More staff training would help."	Continuous training	Professional development	Continuous improvement	Theme 7
"Better integration with other hospital systems is needed."	System integration	Technological improvement	System enhancement	Theme 7

4.2. Theme 1: Health Information Systems Strengthen Risk Management Practices

The results of the interviews revealed that Health Information Systems (HIS) were a key enabler for risk management activities in Saudi hospitals' emergency departments. The participants universally found the systems useful for documenting incidents, tracking workplace risks, facilitating communication and helping to make informed decisions. Respondents in general considered HIS to be an essential part of organisational risk management as it allowed healthcare professionals and managers to detect safety issues in a timely fashion and take action more efficiently.

The most common advantage cited was that the system allows for the efficient reporting of incidents. Some of the participants described that the use of the electronic reporting system made the documentation process quicker and more organised than the earlier paper-based documentation. For instance, R1 said, "The system helps us to report incidents quickly and keeps everything documented", and R3 said, "We use it to record incidents and monitor safety issues regularly". These responses show that electronic documentation was perceived as an important tool for keeping good and proper documentation of safety and making sure that occupational incidents had been monitored.

The role of Health Information Systems (HIS) in communication and information sharing was also highlighted. R4 said the system allows for "improved communication between departments when a risk is reported," which is crucial in emergencies where quick reaction times are needed.

Similarly, R12 noted that the system "supports a safer working environment by improving information sharing", indicating that information sharing helped to make the workplace safer.

Another key discovery was the contribution of Health Information Systems to the decision-making of managers. R8 said that the system "supports decision-making by providing accurate patient and incident data," and R6 said that it "allows managers to review incidents and take corrective action faster. The responses indicate that the participants felt that having access to the correct and timely information was vital for them to make the right decision in risk management and take preventive action.

In addition, some respondents reported that HISs could be used to monitor health care facilities and allowed them to pinpoint common safety issues. The system "helps identify recurring safety issues through regular monitoring," R11 said, which meant that managers were able to see patterns and take steps to improve safety in the longer term due to the availability of historical incident data.

In terms of overall results, it can be concluded that participants considered Health Information Systems as an effective organisational resource for improving risk management practices. These systems enabled better documentation, communication, monitoring, and evidence-based decision-making, which ultimately helped to create safer care environments in the ED.



Figure 4.1. Mindmap for Theme 1

4.3. Theme 2: Electronic Reporting and Real-Time Information

Improve Workplace Safety

The results showed that one of the most important attributes of Health Information Systems, as perceived by the participants, was the electronic reporting system and real-time information access. Respondents universally reported that these capabilities facilitated identification, reporting and management of workplace hazards, and assisted healthcare providers to act promptly when new safety issues arose. The participants felt that digital information systems had made risk management activities much more efficient than manual ones.

The most commonly reported feature was electronic incident reporting. Both R1 and R9 mentioned that the most useful features for their use are the electronic incident reporting feature and the incident tracking function, respectively. These responses suggest that participants were heavily dependent on electronic reporting systems to accurately and efficiently report occupational incidents. Digital reporting helped to decrease paperwork, have more accurate records, and make safety information readily accessible to the appropriate staff member, respondents explained.

The need for real-time notifications and instant access to clinical data was also emphasized. "Real-time alerts help us respond to risks a lot faster," R2 said, highlighting the importance of automated notifications in averting workplace incidents. Likewise, R10 described that "The system enables us to access information immediately in the event of an emergency," and that the quick retrieval of information helped with clinical and operational decision-making in difficult times.

Monitoring and follow-up function in the system was highlighted by several respondents. R4 noted that the reporting dashboard helps track safety incidents, and R11 noted that data reports help management identify common workplace risks. The responses indicated that reporting dashboards and analytical reports were critical in identifying trends, assessing safety performance, and taking action to prevent incidents.

Another common benefit that was mentioned by the participants was communications. R8 said, "The shared patient records make it easier for the staff to communicate; R12 said, "Everything is stored electronically, which makes the follow-up much easier. These statements confirm that

integrated electronic information helped healthcare professionals to collaborate and enhanced continuity in risk management activities.

The results show that the participants saw electronic reporting, access to real-time information, and digital records integration as essential elements of workplace safety. These technological capabilities facilitated the reporting of incidents, improved communication, increased awareness of the risks in organizations, and improved the management of occupational safety in the emergency departments.



Figure 4.2. Mindmap for Theme 2

4.4. Theme 3: Health Information Systems Contribute to the Reduction of Occupational Incidents

The interview results showed that overall, the participants felt the HIS contributed positively to the reduction of occupational incidents in the ED. Respondents explained in various ways how the systems facilitated safer working practices, such as better reporting of incidents, better communication, greater awareness of workplace hazards, and the ability to intervene and

prevent incidents. The participants always perceived HIS as a proactive tool that aids in minimising risks, which can lead to serious occupational injuries.

Increased reporting of incidents and follow-up were frequently reported benefits. R1 said that it has made reporting incidents much quicker than before, and R7 said that "The reporting process has become more organised and transparent. Participants felt that the quicker that incidents were reported, the quicker that managers could investigate and take corrective measures to prevent reoccurrence.

Preventive functions of Health Information Systems were also mentioned by many respondents. R1 explained, "The system notifies us of potential risks before they turn into serious issues, and automated notifications helped with the early identification of risks. Likewise, R6 said, "The system aids in finding unsafe trends that require attention, so it's not a reactive system."

Another important clinical information access factor impacting occupational safety was improved. R2 said that, "Better access to patient information helps us avoid mistakes," and R7 said, "We make safer clinical decisions with timely information provided by the system. These responses illustrate that participants felt that good information would help to minimize clinical mistakes that could put both healthcare workers and patients at risk.

An increase in workplace safety was also noted by participants after the adoption of Health Information Systems. R2 noted that there are "noticeable differences in communication between staff" and R5 reported "faster response to reported incidents from managers". R10 added: I believe the system has contributed to the reduction of avoidable workplace incidents and R12 stated: I feel the system has made the department more organised and focused on safety.

While participants recognised that occupational incidents could not be completely eradicated, they largely shared an opinion that Health Information Systems had made a substantial contribution to improving the organisational practices relating to safety. The systems were seen to enhance communication, encourage timely reporting, raise awareness about workplace hazards, and aid in decision-making to prevent workplace incidents, thereby making a valuable impact in emergency departments.



Figure 4.3. Mindmap for Theme 3

4.5. Theme 4: Organisational and Technical Factors Influence System Effectiveness

Results of the interview showed that the success of supporting Health Information Systems (HIS) in risk management and occupational safety was not only influenced by the technology but also by several organisational and technical aspects. There was a strong emphasis by participants on the need for adequate training, management support, effective communication, robust infrastructure, user-friendly system design, and a positive organisational culture in ensuring the successful use of Health Information Systems. Responses to the systems were mostly positive, but participants recognized the importance of context in determining whether the systems were effective.

One of the most commonly mentioned factors was staff training. The participants felt that with proper training, the healthcare providers could better use the system's features and were more confident in using it. For instance, R1 remarked, "Regular staff training makes the system much easier to use," and R9 remarked, "Staff experience with technology makes a big difference.

These answers indicate that ongoing education helps employees to utilize HIS more effectively and may lead to improved risk management.

It was also important that management support the implementation. As for R4, he said that "Support from hospital management improves system implementation," meaning that if a digital system is supported by management, it will be accepted and used consistently. In the same way, R12 noted that "A positive safety culture makes it easier for staff to apply the system consistently," which illustrates the role of organisational culture in supporting effective technology implementation.

Participants also spoke about the need for technical infrastructure. Being online, accessible and receiving updates regularly was seen as essential for ongoing functionality. R5 said, "Internet speed is very important to have a fast and good internet connection," and R8 said, "Regular system updates make it more efficient. Moreover, R10 described how the ready availability of computers in the department helps to make computers part of people's daily lives, reflecting the role of technological resources.

Organisational factors such as communication and teamwork also came to the fore. R7 noted that "Teamwork and communication help everyone use the system effectively", emphasizing the importance of collaboration within the healthcare industry for the effective utilization of the system.

In all, the results suggest that organisational support, staff competence, technology infrastructure and workplace culture play an integral role in the effectiveness of Health Information Systems. The participants felt that investing in these organisational and technical factors would allow the greatest contribution of HIS to risk management and occupational safety.



Figure 4.4. Mindmap for Theme 4

4.6. Theme 5: Operational Challenges Continue to Limit Effective Use of Health Information Systems

While participants pointed out the numerous benefits of HISs, they also expressed a range of operational issues that hindered their effectiveness in ED settings. Technical issues, lack of training, workload, lack of system integration, time limits and data security issues were identified as barriers. The participants thought that by working on the challenges, the hospitals could get more from the Health Information Systems and enhance workplace safety.

One of the most prevalent concerns was technical problems. R1 said "Sometimes the system is slow on busy shifts" and R3 said "Technical problems sometimes interrupt our work. These kinds of responses point to a potential issue with the system's performance, which can impede the ability to timely access critical information during emergencies decreasing the efficiency of operational response and potentially impacting risk management activities.

Additionally, people stated that inadequate user training restricted the effective use of the system. R2 echoed that "Some staff need more training to use all the features" and R11 said

"Frequent software updates require additional staff training. These answers indicate that HIS have been introduced in hospitals, but further training is required to familiarize and maximize the functions available.

Other obstacles cited by the respondents were workload and time pressure. R4 noted that "Heavy workloads leave little time to complete electronic reporting", showing the practical challenges encountered by the ED staff. Similarly, R10 noted that "Data entry at times takes longer than expected," indicating that in times of increased patient demand, documentation can be a challenge.

Participants further highlighted issues related to system integration and technical support. R8 said "Different hospital systems don't always work together" and R9 said "Limited technical support can be frustrating at times. As these comments suggest, interoperability and timely technical support continue to be a challenge for health care organisations.

Lastly, R12 voiced concerns about "data privacy and security" another important issue related to digital healthcare systems.

In general, respondents recognized that HIS had made improvements in many areas of risk management but technical limitations, lack of training, workload demands, interoperability challenges and privacy issues remain as obstacles to full potential. If these barriers could be overcome, the effectiveness of the system would be increased and occupational safety in emergency departments would be further improved.

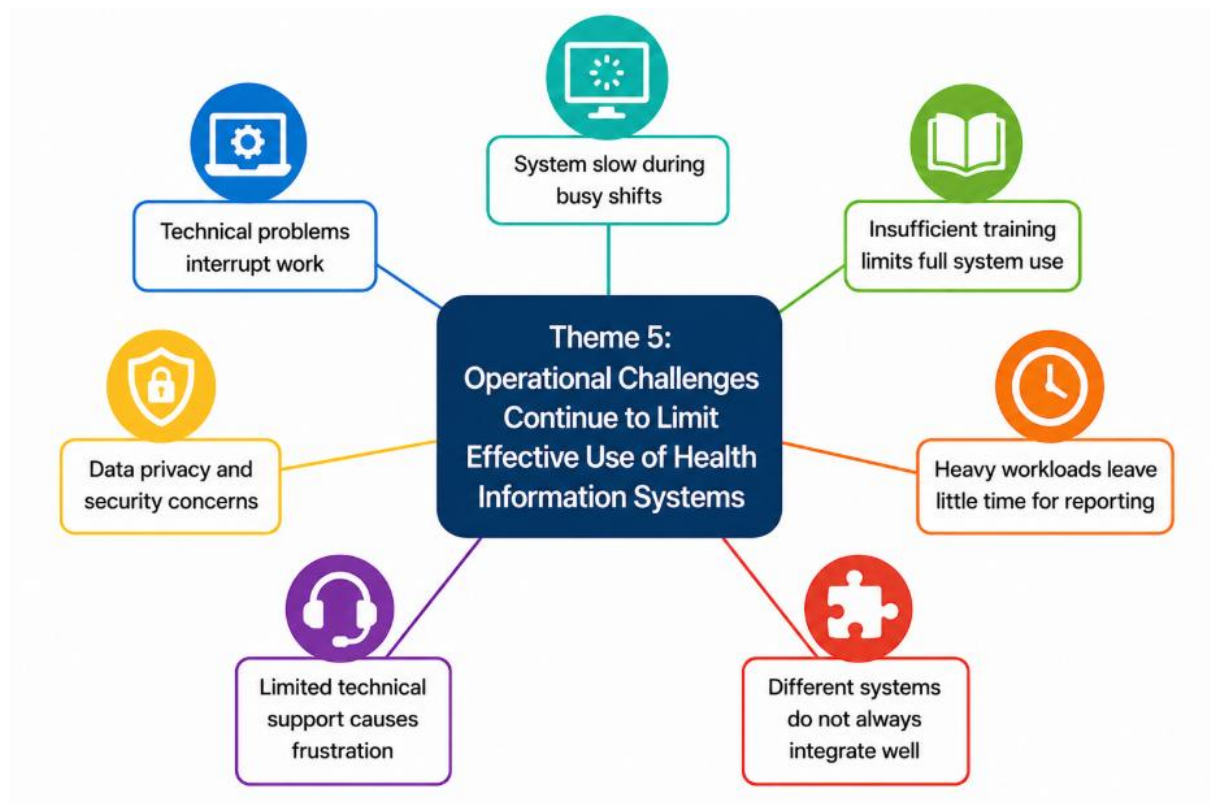


Figure 4.5. Mindmap for Theme 5

4.7. Theme 6: Training, Leadership, and System Usability Enhance User Adoption

Results of the interviews showed that staff training, supportive leadership, effective technical assistance, and ease of system design were all critical elements for successful Health Information Systems adoption. These organisational factors were reported as consistent factors that supported the use of the systems confidently and consistently, and enhanced adherence to workplace safety procedures. Respondents considered user adoption as one of the key components to the effective use of HISE to support risk management programmes.

Training was identified as the most significant factor in determining the user's confidence. R1 said that "Proper training gives staff more confidence in using the system" and R4 said that "Regular training sessions reduce mistakes and improve reporting. The participants felt that continued learning helps health professionals to grow and acquire knowledge and skills to use Health Information Systems effectively. Also, several respondents noted the need for refresher training because systems were constantly in a state of development. For instance, R9 stated that "Refresher training provides staff with the latest features of the systems.

Another theme that emerged across the interviews was leadership support. R2 noted that "Management support encourages everyone to use the system correctly" and R10 noted that "Supportive leadership promotes better compliance with reporting procedures. These answers indicate that the management of a health care institution has a significant impact in fostering staff involvement with Health Information Systems and accountability culture.

System usability and technical support were also discussed. R3 said, "A simple and user-friendly system improves daily work" and R11 said, "Good system usability reduces frustration and improves efficiency. The comments show that intuitive design of the system facilitates its acceptance and minimizes resistance of healthcare experts. R5 also highlighted the importance of technical support, saying that "Technical support is helpful to staff in resolving issues promptly.

Finally R12 distilled the overall significance of these organisational factors by stating that "All three factors play a role in enhancing workplace safety and risk management. The overall sentiment is that technology isn't enough—implementing the technology takes the support of training, leadership, and user-centred system design.

The results overall show that organisations can increase the use of HIS and make it more effective through staff development, supportive leadership, technical assistance and system usability.

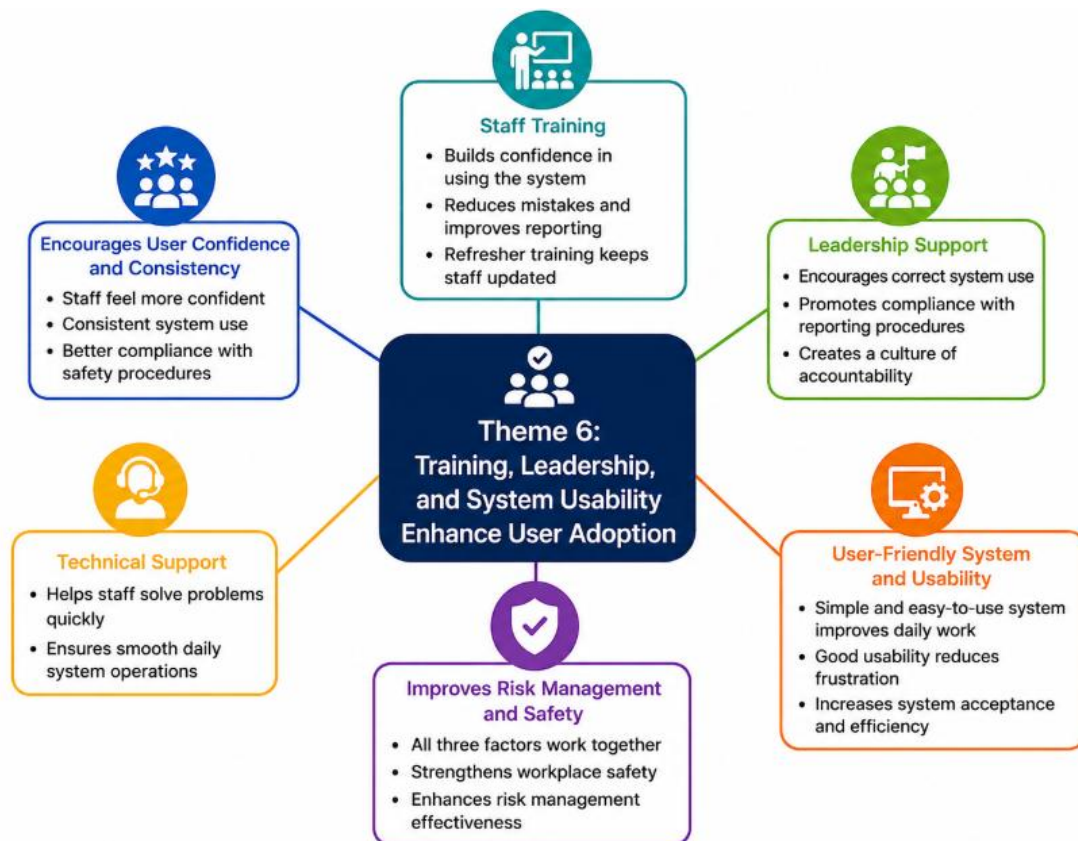


Figure 4.6. Mindmap for Theme 6

4.8. Theme 7: Continuous Improvement Is Necessary to Maximise the Benefits of Health Information Systems

The last theme was on the recommendations that the participants suggested to improve Health Information Systems and strengthen the safety in the workplace in the emergency department. Participants noted that though existing systems had improved the risk management, there was a need for further improvement to maximize its effectiveness. They were mainly centred on ongoing technological innovation, training, organisation, integration and investments in digital health infrastructure.

The most frequent advice was for ongoing staff development. They thought that continuing education would help health care professionals make better use of Health Information Systems and increase adherence to organisation safety protocols. R2 added that "More staff training would help everyone to make use of the system" and R1 added that "The hospital should provide regular training programmes. The responses suggest that they believed continuous professional development was vital for effective use of systems.

Some of the respondents also suggested changes to system functionality and integration. R5 said that, "Better integration with other hospital systems is necessary" and R6 said that, "More automated alerts would be helpful for identifying risks earlier. Participants felt that there was a need for more interoperability and better technological capabilities to improve efficiency and help to manage risk proactively.

Priorities were also mentioned for technical support and organisational investment. R8 suggested that "More technical support should be available for staff" and R10 suggested that "The system should provide more detailed safety reports. Moreover, R1 encouraged hospitals to "Invest in modern Health Information Systems and keep them updated" which indicate that there is a need for continuous technological advancement.

Policy development and organisational collaboration also were considered important. R8 said that hospitals should "Develop clear policies for using Health Information Systems in risk management", and R10 said to promote "collaboration between clinical, IT and risk management teams. The strengthening of data security and regular review of incident information for evidence-based decision making were also pointed out as key by the participants.

Overall, the results suggest that participants considered that continuous improvement is crucial for effective Health Information Systems. They thought that regular upgrading of the system, staff training, increased leadership support, better integration, clear organisational policies and ongoing investment would further improve workplace safety and boost risk management programmes in Saudi hospital emergency departments.

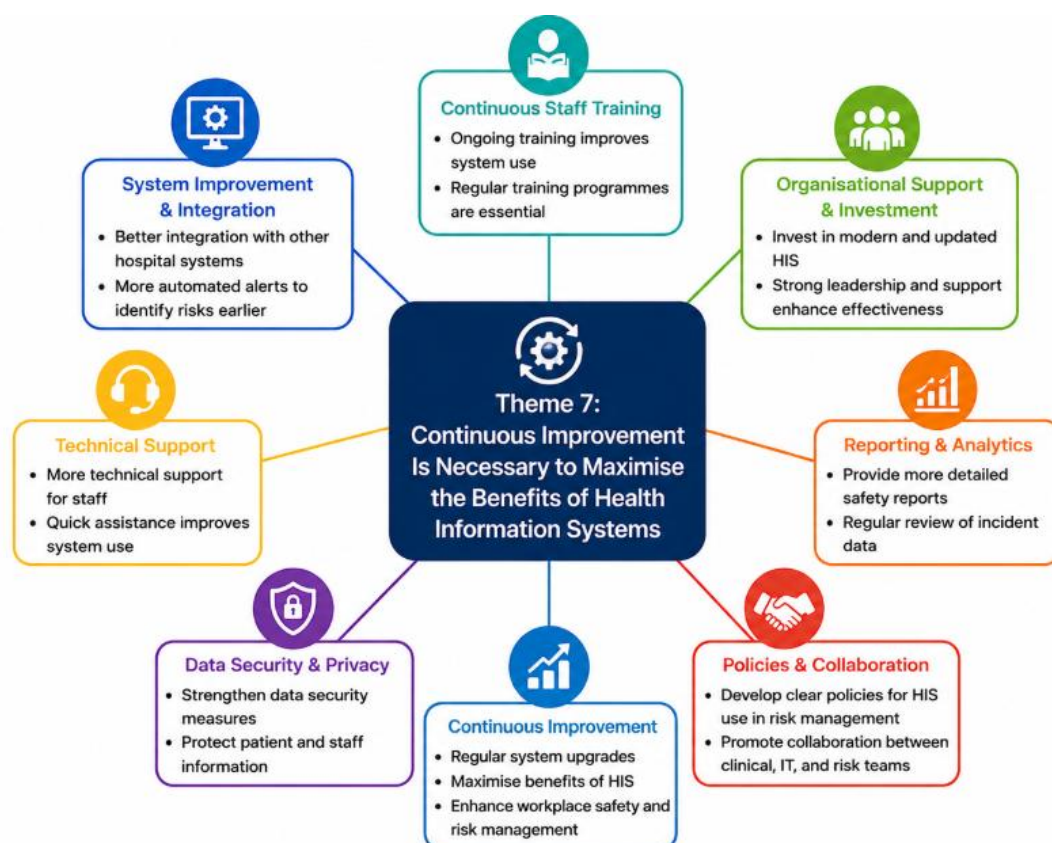


Figure 4.7. Mindmap for Theme 7

Table 4.2. Framework analysis

Theme	Similar Responses	Different Responses	Unique Responses
Theme 1: Health Information Systems Strengthen Risk Management Practices	Most participants agreed that HIS improved incident reporting, documentation, monitoring, communication, and decision-making.	Some participants focused more on documentation and monitoring (R1, R3, R11), while others emphasised communication and managerial decision-making (R4, R6, R8).	R11 uniquely highlighted the use of historical incident data to identify recurring safety issues, while R12 specifically emphasised improved information sharing as a contributor to a safer work environment.

Theme 2: Electronic Reporting and Real-Time Information Improve Workplace Safety	Participants consistently viewed electronic reporting, real-time alerts, and digital records as essential for workplace safety.	Some respondents highlighted electronic incident reporting (R1, R9), whereas others focused on dashboards, alerts, and shared patient records (R2, R4, R8).	R10 uniquely emphasised immediate information access during emergencies, while R12 specifically highlighted easier follow-up through electronic record storage.
Theme 3: Health Information Systems Contribute to the Reduction of Occupational Incidents	Most participants agreed that HIS reduced occupational incidents through faster reporting, improved communication, and better awareness of risks.	Some participants emphasised preventive alerts and monitoring (R1, R6), while others highlighted safer clinical decisions and improved communication (R2, R7).	R12 uniquely described the department as becoming "more organised and safety focused," while R10 specifically linked HIS to reducing avoidable workplace incidents.
Theme 4: Organisational and Technical Factors Influence System Effectiveness	Participants generally agreed that staff training, management support, organisational culture, and technical infrastructure influenced effective HIS implementation.	Some respondents prioritised organisational support (R4, R12), while others stressed infrastructure, internet reliability, or system accessibility (R5, R8, R10).	R7 uniquely highlighted teamwork as a facilitator of HIS effectiveness, whereas R10 specifically emphasised access to computers within the department.
Theme 5: Operational Challenges	Participants agreed that technical problems, inadequate	Some focused on technical issues (R1, R3), while others	R12 uniquely identified data privacy and security

Continue to Limit Effective Use of Health Information Systems	training, workload pressures, and system limitations reduced HIS effectiveness.	emphasised workload, interoperability, and technical support (R4, R8, R9).	concerns, whereas R10 specifically pointed to lengthy data entry processes during busy periods.
Theme 6: Training, Leadership, and System Usability Enhance User Adoption	Participants consistently believed that training, supportive leadership, technical support, and user-friendly systems encouraged effective HIS utilisation.	Some respondents prioritised training (R1, R4, R9), whereas others emphasised leadership support or usability (R2, R3, R11).	R12 uniquely stated that training, leadership, and usability collectively improve workplace safety, highlighting the interaction among all three factors.
Theme 7: Continuous Improvement Is Necessary to Maximise the Benefits of Health Information Systems	Most participants recommended continuous training, system upgrades, stronger technical support, and organisational investment.	Some focused on technological improvements such as automation and integration (R5, R6), while others emphasised organisational policies and collaboration (R8, R10).	R1 uniquely recommended continuous investment in modern HIS, while R10 specifically advocated collaboration between clinical, IT, and risk management teams to strengthen workplace safety.

CHAPTER FIVE

Discussion and Conclusion

5.1 Introduction

The content of this chapter is the discussion and conclusion of the study, The Effectiveness of Health Information Systems in Supporting Risk Management Programs and Reducing Occupational Incidents in Emergency Departments in Saudi Hospitals. The chapter opens with an overview of the main themes identified from the semi-structured interviews with the healthcare professionals employed in emergency departments. The results are analyzed based on the research aims to illustrate the role of Health Information Systems in risk management, occupational safety, and the reduction of workplace incidents. The chapter further brings focus on the organisational and technological determinants of successful implementation of Health Information Systems as well as identified challenges by the participants. Finally, it offers conclusions based on the findings and offers practical recommendations for healthcare organisations and policymakers, describes the limitations of the study, and proposes directions for future research.

5.2 Summary of Findings

The overall aim of this study was to investigate how Health Information Systems (HIS) support risk management programmes and can help to reduce occupational incidents in emergency departments of Saudi hospitals. The study resulted in seven related themes, derived from qualitative interviews with healthcare professionals, which together spoke to the research goals. Overall, the results indicated that participants perceived HIS as valuable organisational tools to enhance workplace safety, improve risk management practices, and as a tool to make better decisions in emergency care settings.

The initial finding was that Health Information Systems are critical in improving risk management practices. Participants always reported how the systems facilitated electronic reporting of incidents, better documentation, better inter-departmental communication, and continuous monitoring of the risks within the workplace. Additionally, respondents noted that HIS has been helpful in communicating timely and accurate information to managers to allow for timely investigations and corrective actions. This mean that HIS is key elements for

managing the risk of any organization as they can enhance the quality and availability of information that can be used in order to make decisions for safety(Aydin et al., 2025).

The second was that electronic reporting systems and real-time information have been shown to have a significant effect on workplace safety (Campione & Liu, 2024). The participant highlighted the following valuable features of HIS: electronic incident reporting, automated alerts, digital patient records, reporting dashboard, and shared information systems. These functions, they believed, would minimize paperwork, increase the correctness of reporting, increase communication among healthcare professionals, and provide faster response during emergencies. Reliable information available immediately at the scene of the emergency situation was considered very important, especially in emergency departments, where prompt clinical decisions are of fundamental importance to protect not only patients, but also healthcare workers.

Another key discovery related to the role of HIS in the reduction of occupational incidents. Participants consistently reported that the systems led to an increase in the awareness of hazards in the workplace, assisted in preventative interventions, decreased errors in documentation, and quicker reporting of incidents (Dixon et al., 2025). They also indicated that HIS allowed managers to see patterns of safety concerns, track workplace trends, and make proactive adjustments to prevent minor occupational incidents from escalating to more severe injuries. While participants recognized that Health Information Systems would not prevent every workplace incident, they overwhelmingly felt the systems have greatly enhanced the safety of workers in their departments.

The results also showed that the organisational and technical aspects play a major role in the effectiveness of Health Information Systems. Attendees noted the importance of staff training, leadership, positive culture, technology infrastructure, communication, and computer access when it comes to successful implementation. Participants thought these organisational conditions fostered increased employee interaction with Health Information Systems and boosted their involvement in occupational safety. Consequently, the results indicate the need for technological investment together with suitable organisational strategies and ongoing employee training.

Although there were positive perceptions about Health Information Systems, participants noted some challenges that were hindering the effectiveness of these systems. The most common obstacles were technical difficulties, inadequate system performance, lack of training,

workload, interoperability issues, time constraints and data privacy issues. The participants described how these difficulties sometimes hampered the reporting of incidents and the dissemination of relevant safety information, especially during a busy shift working in the ED. These results show that there are still technological and organisational constraints that should be addressed in hospitals to maximise the effectiveness of Health Information Systems (Jewer, 2022). Another important finding related to the factors that encourage successful user adoption of Health Information Systems. Staff training, supportive leadership, technical assistance, and an easy-to-use system design were identified as necessary supports to build confidence and to get systems to be used regularly across all participants. They felt that regular training programmes helped to minimize reporting errors, maximize use of the system, and enhance adherence to OS procedures. Similarly, support from health system leadership and technical support was identified as a key factor to facilitate the adoption of Health Information Systems into daily clinical practice by health care professionals.

Lastly, some practical recommendations were offered by participants regarding how to enhance Health Information Systems in Saudi hospitals (Issah & Adam, 2026). The most common recommendations were to offer ongoing staff training, modernize the current system, enhance interoperability of various hospital information systems, provide greater technical support, streamline the reporting process, improve cybersecurity, and establish clear policies in the organization regarding the use of Health Information Systems. The participants also suggested the need for more cooperation between health workers, IT experts, management, and policymakers of the hospital to have effective participation in the development of the system for workplace safety in the future.

In general, the results showed that Health Information Systems are generally seen as good instruments to support occupational risk management and reduce work accidents in emergency departments. Technical and organisational issues were identified, but so too was the continued need for investment in digital infrastructure, staff capability development, organisational support and system improvement to further enhance workplace safety and strengthen risk management practices across Saudi hospitals (Shafik et al., 2026).

5.3 Conclusions

This study investigated the effectiveness of Health Information Systems (HIS) in assisting risk management programmes for reducing occupational incidents in emergency departments in Saudi hospitals. Therefore, the study can be concluded that Health Information Systems play a

significant role in improving workplace safety by providing timely reporting of workplace incidents, improving communication, evidence-based decision-making, and continuous monitoring of workplace risks. Throughout, the participants consistently saw HIS as a key organisational resource that enhances risk management and supports a safer healthcare setting.

The findings also highlight that technological issues are not the only ones influencing the success of Health Information Systems (HIS), as other factors, such as training, leadership support, HIS usability and organisation culture also play a significant role. Participants identified a number of benefits of the use of HIS, but acknowledged the challenges of technical issues, lack of training, workload, and limited system integration which if unaddressed can have an impact on the effectiveness of the system. In conclusion, the study revealed that Health Information Systems have great potential in enhancing occupational safety, as well as reinforcing risk management in the emergency departments. These benefits can, however, only be achieved through investment, regular staff training, effective technical support and organisational commitment. The recommended improvements can help address these challenges, maximising the value of HIS and further improving the safety of healthcare professionals and patients in Saudi hospitals.

5.4 Practical Implications

The implications of the results of this study for the hospital administrators, healthcare professionals, information technology offices, and organizations that champion healthcare quality and patients' safety in Saudi Arabia are significant. As Health Information Systems has become more of an integral part of health care, the results of this study can be used to make tangible recommendations for improving fall risk management in the workplace and reducing fall incidents in Emergency departments. The outcomes indicate that hospital management needs to invest in modern and reliable Health Information Systems that would facilitate efficient reporting and real-time monitoring and implementation of communication. Ensuring the availability of electronic reporting systems in all healthcare facilities for all staff in emergency departments and that the systems are fully embedded in day-to-day hospital practice is important. The performance of the system should also be monitored at regular intervals with a view to identifying technical problems ahead of time and minimising operation and process disruption wherever possible. Improved interoperability would bring various benefits of reducing additional documentation, improving data sharing between different departments and facilitating clinical decision making. Also, hospitals should have technical support teams which

can attend and solve the issues promptly, especially during the peak hours in the emergency department.

At the policy level, Saudi Health Ministry (SHM) and other healthcare authorities could use these insights to support the development of the National Digital Health Strategy; for instance, by offering guidelines for implementing and evaluating Health Information Systems (HIS) on a standardised basis in hospitals. Healthcare providers need to have the same expectations with regards to electronic incident reporting, workplace risk management and information security, and extend financial and technological assistance for digital transformation projects. Finally, the findings point to the need for the regular assessment of the system. By continually reviewing the incident reports, assessing the performance of the system, obtaining feedback from users, and evaluating indicators to assess working safety, the system can be further enhanced. With the aid of technological advances, organizational buy-in, leadership, and continuous employee training, industry adopters can leverage the potential of HIS to create a healthier and safer work environment for healthcare workers, boost the quality of healthcare services, and streamline efficient services to patients in hospitals in Saudi Arabia.

5.5 Recommendations

Based on the outcome of this study, the following recommendations are suggested to increase the effectiveness of Health Information Systems (HIS) in risk management programmes, and reduce occupational incidents in the emergency departments (ED) of Saudi hospitals.

Routine and comprehensive training programs for all health systems users should be organised by hospitals. Staff should be regularly trained to ensure they are updated on system changes, electronic reporting and steps for risk management. Staff should receive regular training to keep them updated with system changes, electronic reporting and implementation of risk management. This will likely lead to increased knowledge and confidence in the use of the system which will result in better reporting accuracy, and increased use of the HIS in a clinical setting.

Secondly, a positive safety culture within the organisation is to be encouraged to build up the support for Health Information Systems in hospitals. Healthcare professionals should report incidents and near misses without fear or worry of blame or discipline. The supervising personnel should encourage workers to create an electronic reporting system, and then regularly remind them of their safety performance and incident results.

Thirdly, it is important that healthcare organizations invest in digital infrastructure upgrades. It will be necessary to ensure a reliable Internet connection, enhanced system speed, greater interoperability between different hospital information systems, and technical assistance. These improvements could facilitate systems to be less disrupted, improving information sharing, and timely decision-making during emergencies.

Fourthly, the need to establish regular monitoring and evaluation mechanisms in hospitals for Health Information Systems. Feedback with users regularly, noting technical problem and areas for improvement. Incident reports and safety performance figures should also be regularly reviewed to evaluate the value of HIS to organisational risk management and health and safety.

These will be useful for enhancing risk management programmes and work safety at hospitals in Saudi.

5.6 Recommendations for Future Research

Future research can explore the effectiveness of HIS with larger sample sizes in more regions and healthcare organizations in Saudi Arabia to enhance the generalisability of the findings. Comparative research between public and private hospitals may offer additional information on comparative aspects of system implementation and occupational safety practices. A quantitative or mixed methods study design could also be used to explore the association of Health Information Systems, risk management performance, and reduction in occupational incidents. Furthermore, future studies may explore the impact of new technologies like AI and predictive analytics on healthcare risk and safety in the workplace.

5.7 Chapter Summary

This chapter presented the results of the study, and drew conclusions from the experiences of healthcare professionals working in emergency departments. The study confirmed the importance of contributing role of HIS in risk management programmes and occupational safety. It also highlighted organisational factors that help in implementing the system successfully and operational challenges that need constant attention. Practical implications, recommendations for healthcare organisations and policy makers and suggestions for future research were presented. In general, the study infers that ongoing investment in the Health Information Systems, training of employees and organizational support will bolster the workplace security and improve risk management in Saudi hospitals.

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Appendix A

Interview Transcription

Q1. How do Health Information Systems support risk management activities in your emergency department?

Respondent	Response
R1	The system helps us report incidents quickly and keeps everything documented.
R2	It makes it easier to identify risks before they become serious problems.
R3	We use it to record incidents and monitor safety issues regularly.
R4	It improves communication between departments whenever a risk is reported.
R5	The alerts and patient information help us avoid many mistakes.
R6	It allows managers to review incidents and take corrective action faster.
R7	The system keeps all safety records in one place, which is very useful.
R8	It supports decision-making by providing accurate patient and incident data.
R9	It helps us follow hospital safety protocols more consistently.
R10	The reporting process is much faster than the old paper-based system.
R11	It helps identify recurring safety issues through regular monitoring.
R12	Overall, it supports a safer working environment by improving information sharing.

Q2. In your experience, which features of the Health Information System are most useful for identifying and managing workplace risks?

Respondent	Response
R1	The electronic incident reporting feature is the most useful for us.
R2	Real-time alerts help us respond to risks much more quickly.
R3	Patient records are very helpful when making clinical decisions safely.
R4	I find the reporting dashboard useful for tracking safety incidents.
R5	Automatic notifications remind us about important safety procedures.
R6	The system's documentation feature helps us review previous incidents.
R7	Clinical decision support tools reduce the chances of making errors.
R8	The shared patient records improve communication among staff.

R9	I think the incident tracking feature is the most valuable part.
R10	The system allows us to access information immediately during emergencies.
R11	Data reports help management identify common workplace risks.
R12	Everything being stored electronically makes follow-up much easier.

Q3. How effective do you believe the current Health Information System is in supporting risk management programmes?

Respondent	Response
R1	I think it is very effective, but staff training could still be improved.
R2	It has definitely improved how we manage workplace risks.
R3	The system works well, although there are occasional technical issues.
R4	It supports risk management, but regular updates would make it even better.
R5	Overall, I believe it has reduced many reporting delays.
R6	It is effective because information is available whenever we need it.
R7	I would say it is effective, especially for documenting safety incidents.
R8	It has made our risk management process more organised and efficient.
R9	The system performs well, but some staff need additional training to use it fully.
R10	It is a useful tool that has improved workplace safety in our department.
R11	I believe it has strengthened our overall safety culture.
R12	It is effective, although there is still room for improvement in system integration.

Q4. How has the use of Health Information Systems influenced the reporting and management of occupational incidents in your department?

Respondent	Response
R1	It has made reporting incidents much quicker than before.
R2	We can now document incidents more accurately and easily.
R3	Managers receive reports faster and respond more quickly.
R4	It has improved follow-up after workplace incidents.
R5	Staff are more willing to report incidents using the electronic system.
R6	It helps us keep proper records for future reference.
R7	The reporting process has become more organised and transparent.
R8	We can identify repeated incidents much more easily now.
R9	It has reduced paperwork and saved a lot of time.

R10	Incident reports are shared with the right departments immediately.
R11	The system makes monitoring safety incidents much easier.
R12	Overall, it has improved both reporting and incident management.

Q5. Can you describe any ways in which the Health Information System has helped prevent workplace injuries or safety incidents?

Respondent	Response
R1	The system alerts us to potential risks before they become serious.
R2	Better access to patient information helps us avoid mistakes.
R3	It reminds staff to follow infection control procedures.
R4	We learn from previous incidents recorded in the system.
R5	It improves communication during emergency situations.
R6	The system helps identify unsafe trends that need attention.
R7	It supports safer clinical decisions through timely information.
R8	Managers use the data to introduce better safety measures.
R9	We can quickly access safety protocols whenever needed.
R10	Electronic records reduce documentation errors.
R11	It helps us recognise common hazards in the department.
R12	The system encourages staff to report near misses before bigger problems occur.

Q6. Have you observed any improvements in occupational safety since the implementation of the Health Information System? Please explain.

Respondent	Response
R1	Yes, incident reporting has become much faster and more accurate.
R2	Yes, communication between staff has improved noticeably.
R3	Yes, we are more aware of workplace risks than before.
R4	Yes, safety procedures are followed more consistently now.
R5	Yes, managers respond to reported incidents more quickly.
R6	I have noticed fewer documentation mistakes since the system was introduced.
R7	Yes, staff can access important information much more easily.
R8	There has been a clear improvement in monitoring workplace safety.
R9	Yes, although regular staff training is still needed.
R10	I believe the system has helped reduce avoidable workplace incidents.

R11	Yes, safety discussions are now based on accurate incident data.
R12	Overall, the department has become more organised and safety focused since the system was implemented.

Q7. What factors facilitate the effective use of Health Information Systems for managing occupational risks?

Respondent	Response
R1	Regular staff training makes the system much easier to use.
R2	Good technical support helps us resolve issues quickly.
R3	User-friendly system features encourage staff to use it regularly.
R4	Support from hospital management improves system implementation.
R5	Fast and reliable internet access is very important.
R6	Clear hospital policies encourage proper use of the system.
R7	Teamwork and communication help everyone use the system effectively.
R8	Regular system updates improve its overall performance.
R9	Staff experience with technology makes a big difference.
R10	Easy access to computers in the department supports daily use.
R11	Continuous monitoring and feedback help improve the system.
R12	A positive safety culture encourages staff to use the system consistently.

Q8. What challenges or barriers affect the effective use of Health Information Systems in your emergency department?

Respondent	Response
R1	Sometimes the system is slow during busy shifts.
R2	Some staff need more training to use all the features.
R3	Technical problems occasionally interrupt our work.
R4	Heavy workloads leave little time to complete electronic reporting.
R5	Some employees are resistant to changing from old methods.
R6	Internet or network issues can delay access to information.
R7	The system could be more user-friendly.
R8	Different hospital systems do not always work well together.
R9	Limited technical support can be frustrating at times.
R10	Data entry sometimes takes longer than expected.
R11	Frequent software updates require additional staff training.
R12	There are occasional concerns about data privacy and security.

Q9. How do staff training, organisational support, or system usability influence the effectiveness of the Health Information System?

Respondent	Response
R1	Proper training gives staff more confidence in using the system.
R2	Management support encourages everyone to use the system correctly.
R3	A simple and user-friendly system improves daily work.
R4	Regular training sessions reduce mistakes and improve reporting.
R5	Technical support helps staff solve problems quickly.
R6	When staff understand the system well, risk management becomes more effective.
R7	Strong organisational support increases staff commitment to using the system.
R8	Easy navigation saves time during emergency situations.
R9	Refresher training keeps staff updated on new system features.
R10	Supportive leadership promotes better compliance with reporting procedures.
R11	Good system usability reduces frustration and improves efficiency.
R12	All three factors work together to improve workplace safety and risk management.

Q10. What improvements would you recommend to enhance the effectiveness of Health Information Systems in supporting risk management?

Respondent	Response
R1	I think regular system updates would improve its performance.
R2	More staff training would help everyone use the system effectively.
R3	The system should be easier to use during busy shifts.
R4	Faster response times would improve daily operations.
R5	Better integration with other hospital systems is needed.
R6	More automated alerts could help identify risks earlier.
R7	The reporting process should be simpler and quicker.
R8	More technical support should be available for staff.
R9	Regular feedback from users should be considered when updating the system.
R10	The system should provide more detailed safety reports.
R11	Mobile access would make reporting incidents more convenient.
R12	Continuous evaluation of the system would help improve its effectiveness.

Q11. What organisational changes could improve the use of Health Information Systems for occupational safety?

Respondent	Response
R1	The hospital should provide regular training programmes.
R2	Management should encourage staff to report incidents without fear.
R3	More IT support staff would improve system usage.
R4	Better communication between departments would help.
R5	Staff should receive regular updates on safety policies.
R6	Hospitals should invest more in digital infrastructure.
R7	Workloads should be managed so staff have time to use the system properly.
R8	Strong leadership support would encourage better system adoption.
R9	Regular safety meetings could improve awareness.
R10	The hospital should recognise and reward good reporting practices.
R11	Standardised procedures for using the system would improve consistency.
R12	Continuous monitoring and evaluation would strengthen occupational safety.

Q12. What recommendations would you offer to hospital management or policymakers for strengthening workplace safety through Health Information Systems?

Respondent	Response
R1	Invest in modern Health Information Systems and keep them updated.
R2	Provide continuous training for all healthcare professionals.
R3	Encourage a culture where staff can report incidents openly.
R4	Improve integration between different hospital information systems.
R5	Allocate sufficient resources for system maintenance and technical support.
R6	Involve healthcare staff when planning new system improvements.
R7	Strengthen data security to build users' confidence.
R8	Develop clear policies for using Health Information Systems in risk management.
R9	Regularly review incident data to improve safety practices.
R10	Promote collaboration between clinical, IT, and risk management teams.
R11	Monitor system performance and address technical issues promptly.
R12	Continue investing in digital healthcare initiatives to improve workplace safety.

Appendix B

Participant information sheet

Study Title

The Effectiveness of Health Information Systems in Supporting Risk Management Programs and Reducing Occupational Incidents in Emergency Departments in Saudi Hospitals

Invitation to Participate

You are invited to participate in a research study conducted as part of a Master's degree at MidOcean University. Before deciding whether to participate, please read the following information carefully. The purpose of this information sheet is to explain why the study is being conducted, what participation involves, and how your information will be handled. If you have any questions or require further clarification, please feel free to contact the researcher.

Your participation in this study is entirely voluntary.

Purpose of the Study

The purpose of this study is to explore the effectiveness of Health Information Systems (HIS) in supporting risk management programmes and reducing occupational incidents within emergency departments of Saudi hospitals. The study seeks to understand healthcare professionals' experiences and perceptions regarding the use of Health Information Systems for identifying, reporting, monitoring, and managing workplace risks. The findings are expected to contribute to improving occupational safety practices and supporting healthcare organisations in enhancing risk management through digital health technologies.

Why Have I Been Invited?

You have been invited because you are a healthcare professional working in an emergency department of a Saudi hospital and have experience using Health Information Systems in your daily professional activities. Your knowledge and experience are valuable for understanding how these systems contribute to workplace safety and risk management.

Participants may include:

Emergency physicians

Nurses

Risk management officers

Health information specialists

Hospital administrators

Do I Have to Take Part?

No. Participation is entirely voluntary.

You are free to decide whether or not to participate. If you agree to participate, you will be asked to sign an informed consent form before the interview begins.

You may withdraw from the study at any time without giving a reason and without any negative consequences. If you choose to withdraw before the interview data have been analysed, your interview data will be removed from the study upon request.

What Will I Be Asked to Do?

If you agree to participate, you will be invited to take part in a semi-structured interview.

During the interview, you will be asked open-ended questions about:

Your experience using Health Information Systems.

The role of Health Information Systems in risk management.

Occupational safety within emergency departments.

Incident reporting and workplace safety practices.

Challenges and recommendations for improving Health Information Systems.

The interview is expected to last approximately 30–45 minutes.

With your permission, the interview will be audio-recorded to ensure that your responses are captured accurately. If you do not wish to be recorded, you may decline, and detailed written notes will be taken instead where appropriate.

Are There Any Risks?

The study presents minimal risk to participants.

Some questions may encourage you to reflect on workplace experiences; however, you are not required to answer any question that makes you feel uncomfortable. You may pause or stop the interview at any time.

No sensitive personal information beyond your professional experience will be requested.

Are There Any Benefits?

Although you may not receive any direct personal benefit, your participation will contribute to research aimed at improving Health Information Systems, workplace safety, and risk management practices within Saudi hospitals.

The findings may assist healthcare managers, policymakers, and hospital administrators in developing strategies that improve occupational safety and healthcare quality.

Confidentiality and Privacy

Your privacy will be fully protected throughout the research process.

Your name will not appear in the thesis or any publications.

A participant code (e.g., Participant 1 or R1) will be used instead of your identity.

Any information that could identify you or your organisation will be removed during transcription.

Only the researcher and academic supervisor(s) will have access to the research data.

All information will be treated as confidential.

Data Storage and Protection

Interview recordings and transcripts will be stored securely using password-protected electronic storage.

All research data will be used solely for academic purposes related to this study.

The data will be retained in accordance with the University's research data management policy and securely destroyed after the required retention period.

Voluntary Participation and Right to Withdraw

Participation in this research is voluntary.

You have the right to:

Decline participation.

Refuse to answer any interview question.

Withdraw from the interview at any stage.

Request that your interview data be removed before data analysis begins.

Your decision will not affect your employment, professional relationships, or your organisation in any way.

How Will the Results Be Used?

The information collected during this study will be analysed using thematic analysis.

The findings will be included in the researcher's Master's thesis and may also be presented at academic conferences or published in scholarly journals. No participant or hospital will be identified in any reports or publications.

Ethical Approval

This study will be conducted in accordance with the ethical principles governing academic research and will receive approval from the relevant ethics committee of MidOcean University before data collection begins.

Contact Information

If you have any questions about this study, please contact:

Researcher

Name: Abeer Salah Aldhahri

Email: Abeer.a-dhahri@hotmail.com

Telephone: +966598712317

Supervisor

Name: _____

Email: _____

Telephone: _____

Consent

If you decide to participate, you will be asked to sign a separate Informed Consent Form confirming that:

You have read and understood this Participant Information Sheet.

You have had the opportunity to ask questions.

You understand that participation is voluntary.

You agree to participate in the study.

You understand that you may withdraw at any time before data analysis without penalty.

Thank you for considering participation in this research. Your time, experience, and valuable insights are greatly appreciated.