Arab American University
Faculty of Graduate Studies

Improving researcher and healthcare provider friendliness in archiving and retrieval of patient health information in currently used health information systems in Palestinian hospitals

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Thesis Approval

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Declaration

This thesis was submitted in partial fulfillment of the requirement for Master's degree in Health Informatics.

I declare that the content of this thesis whole or any part of the same has not been submitted before in order to qualify for any other academic degree for any other university or institution. All the ethics transactions and guidelines have been followed duly while establishing the thesis.

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Date:

Sig:

Dedication

Every hard effort needs self-dependability, faith, and courage to dispose of fear.

I dedicate my humble thesis to my homeland, Palestine, and my identity.

My beloved parents; they reason for what I became today; for loving me and supporting and encouraging me to believe in myself, encouraging me to do the best.

My beloved wife, who encourages me and leads me through the valley of darkness with the lighting of hope and support,

To my cherished brother and, sisters

To my supervisors and all who bolstered me in finalizing this work,

My friends who encourage and support me,

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Abstract

Background: Currently, governmental as well as private hospitals, clinics, community health and primary health care centers use some sort of electronic health information system (eHIS) to manage and archive health information. The general aim of this study was to obtain recommendations to improve the user friendliness in archiving and retrieval of patient health information in the currently used eHIS in Palestinian hospitals.

Methods: In this study, in-depth qualitative interviews in an explorative design were used. The in-depth qualitative interviews were conducted in compliance with the consolidated criteria for reporting qualitative research checklist. The interviews were conducted with the help of an interview guide that was developed for this study. The interviewees were recruited from different hospitals/clinics that belonged to the governmental, private, and UNRWA sectors. The audio recorded interviews were transcribed and their contents were analyzed thematically.

Results: Of the interviewees, more than half (66.7%) were female, 25 (69.4%) were younger than 30 years, 33 (91.7%) had bachelor's degree, 6 (16.7%) were physicians, 32 (88.9%) were employed by private hospitals, 14 (38.9%) had an experience of 5 years and more, 11 (30.6%) used the eHIS more than 50 times weekly, and 14 (38.9%) spent more than 30 hours on the eHIS weekly. When the interviewees were asked to express their views and opinions on the eHIS, the majority of the interviewees (75.0%) thought that both the eHIS and the paper-based archiving system were inflexible. Additionally, 55.6% of the interviewees reported that the currently used eHIS did not fulfill their needs. The qualitative analysis of the interviews led to the emergence of multiple themes and subthemes. The themes include experiences of the interviewees with the eHIS, advantages of the eHIS compared to the paper-based system, disadvantages of the eHIS compared to the paper-based system, general recommendations to improve the current eHIS, advantages to

facilitate data collection for the purpose of scientific research, recommendations to improve the accuracy, security, and flexibility of data archiving and retrieval, archive and save data more efficiently and effectively than a paper document, recommendations to improve the security and confidentiality level of the eHIS, recommendations to improve archiving of patient's information, recommendations to protect the archived data from loss, and additional recommendations to improve the currently used eHIS.

Conclusion: Healthcare professionals (physicians, nurses, and pharmacists) and medical records staff were generally not satisfied with the user friendliness and effectiveness of the currently used eHIS in Palestinian hospitals. Despite some disadvantages, the interviewees in this study stated that the eHIS provided advantages over the paper-based archiving systems. The interviewees provided recommendations that can be used to improve the user friendliness, effectiveness of the eHIS in facilitating archiving and retrieval of patients' health information, collection of data for scientific research, accuracy, security, confidentiality, and flexibility of data archiving and retrieval. These findings might be informative and developers of eHIS to improve the currently used eHIS in Palestinian hospitals.

Keywords: Electronic health information system, Health informatics, Hospitals, Archiving, Retrieval, Patient safety

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List of Abbreviations

AHP	Analytic Hierarchy Process
COREQ	Conducted in compliance with the consolidated criteria for reporting qualitative research
DHIS2	District Health Information Systems 2
eHIS	Electronic health information systems
UNRWA	United Nations Relief and Works Agency for Palestine Refugees in the Near East
WHO	World Health Organization

CHAPTER ONE

Introduction

1 Introduction

This chapter provides a general introduction. This chapter also introduces the problem statement, gap in the literature, why this study should be conducted, and highlights the importance of this study. This chapter contains background and significance, problem statement, research assumptions, research hypothesis, and aims of the study (general aim and specific objectives).

In modern healthcare systems, electronic health information systems (eHIS) have been introduced to ensure credible and accessible health information. In different hospitals, eHIS allows making strategic decisions that can save lives and improve health of the patients (Sittig et al., 2020). Through eHIS, healthcare professionals, managers, and decision makers access relevant information to make informed decisions, plan, and provide healthcare services (Williams, Oke, & Zachary, 2019).

The World Health Organization (WHO) defines eHIS as "*the application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of health care information, data, and knowledge for communication and decision making*" (Thompson & Brailer, 2004). In different hospitals, the eHIS also archiving and retrieval of health information that can be used by healthcare professionals, managers, and decision makers (Lippeveld, Sauerborn, Bodart, & Organization, 2000).

1.1 Background and significance

In healthcare, healthcare professionals, managers, and decision makers are faced with an overwhelming amount of information on health issues, nutrition, disease prevention, disease management, and pharmacotherapy (Sheikh et al., 2021). Hospitals, clinics, community health and primary health care centers are important healthcare facilities in any healthcare system around the world. Because data are continuously generated within the healthcare systems, there is a pressing

need to continuously search for better ways to manage the overwhelming amount of information that can be used by healthcare professionals, managers, decision makers, patients, and the community.

Currently, governmental as well as private hospitals, clinics, community health and primary health care centers use some sort of eHIS to manage and archive health information (Shawahna, 2019). Despite the wide use of these eHIS, healthcare professionals, managers, decision makers, and researchers face obstacles finding complete or adequate patient data/information that can be used to inform decisions or be used in scientific studies and analysis (Shawahna, 2019). In daily practice, many healthcare professionals, managers, decision makers, and researchers complained from the user unfriendliness of the currently used eHIS in the Palestinian hospitals, clinics, community health and primary health care centers and reported difficulties while retrieving important patient information.

1.2 Problem statement

Because healthcare professionals, managers, decision makers, and researchers complained from the user unfriendliness of the currently used eHIS in the Palestinian hospitals, clinics, community health and primary health care centers and reported difficulties while retrieving important patient information, there is a pressing need to improve the user friendliness in archiving and retrieval of patient health information in the currently used eHIS in Palestinian hospitals (Shawahna, 2019). It is noteworthy mentioning that implementation of eHIS was met with difficulties in many healthcare systems, notably in developing countries (Rosewell, Shearman, Ramamurthy, & Akers, 2021; Sheikh, Sood, & Bates, 2015; Yusof & Sahroni, 2018). In addition to the user

unfriendliness, healthcare professionals, managers, decision makers, and researchers reported incorrect, fragmented, missing, and outdated patient information in eHIS.

Hospitals, clinics, community health and primary health care centers often need to store health information for long periods. With the passage of time, access to these data can become difficult. This can hamper provision of quality healthcare services to the patients and might jeopardize the safety of the patients. Therefore, improving archiving and retrieval of patient health information could be of high importance of hospitals, clinics, community health and primary health care centers.

Views, opinions, and recommendations of healthcare professionals, managers, decision makers, and researchers on how to improve the user friendliness in archiving and retrieval of patient health information in the currently used eHIS in Palestinian hospitals were not explored before.

1.3 Research assumptions

In this qualitative study, it was assumed that the study participants would answer the interview questions honestly and accurately. Additionally, the participants were assumed to be interested in improving the eHIS, archiving, and retrieval of health information of the patients.

1.4 Research hypotheses

In this study, the main hypotheses were:

- The participants would express their views, opinions, and recommendations on how to improve the user friendliness in archiving and retrieval of patient health information in the currently used eHIS in Palestinian hospitals.

- The recommended features would improve the currently used eHIS in Palestinian hospitals in archiving and retrieval of patient health information by healthcare professionals, managers, decision makers, and researchers.

1.5 Aims of the study

1.5.1 General aim

The general aim of this study was to obtain recommendations to improve the user friendliness in archiving and retrieval of patient health information in the currently used eHIS in Palestinian hospitals.

1.5.2 Specific objectives

This study was conducted to achieve the following specific objectives:

- Conduct qualitative interviews with healthcare professionals (physicians, nurses, and pharmacists), and medical records staff to explore their views on the challenges and barriers they face when accessing and retrieving complete patient health information using the current eHIS.
- Another objective was to obtain recommendations on how to improve the user friendliness in archiving and retrieval of patient health information in the currently used eHIS in Palestinian hospitals.

CHAPTER TWO

Literature review

2 Literature review

An integrated eHIS provides a shared platform that enables the effective and dynamic interaction of four primary subsystems, namely the eHIS, the laboratory system, the picture archiving and communication system, and the enterprise resource planning system (Agrawal, Giri, Gupta, Khatri, & Devkota, 2022). These subsystems are the eHIS, the laboratory system, the picture archiving and communication system, and the enterprise resource planning system. The implementation is hampered by challenges such as a lack of understanding and an unfavorable attitude toward computer use, the use of time, a workforce lacking in information technology, high electricity costs, expensive technology and equipment, and inadequate data safety and security. However, implementation of this system is unavoidable due to the inherent benefits it offers, such as effective storage and prompt retrieval, comparison of laboratory and imaging data over time, cash billing, institutional resource planning, and ease of processing insurance claims. This is particularly important given that the government of Nepal intends to finance the public health sector via the national health insurance system. A great number of hospitals are having difficulty developing and maintaining the integration of eHIS. The goal was to have a conversation about the approaches that were taken to implement this strategy within the setting of a district hospital, as well as the challenges that were inherent and the impacts that were produced.

By easing physician work procedures and research, the healthcare information system of an organization can be leveraged to enhance relationships with its physicians (Quinn, Weber, & Ciotti, 1997). Effective healthcare information systems should give physicians with custom-tailored census reports, enable physicians with access to information via dedicated personal computers or terminals, and have user-friendly screen layouts and graphical user interfaces. In addition, the healthcare information system must give detailed reporting, provide online ordering,

and be responsive to the needs of busy clinicians. A quality healthcare information system also facilitates physician-related tasks outside of the hospital. For instance, physician office managers should have access to billing information contained in the healthcare information system, such as patient demographics and procedure codes. In addition, physicians should be able to access archived data from their offices or homes. Administration's attitude and support are essential to physicians' effective use of a company's healthcare information system. An organization that prioritizes physician challenges and wants can make even a rudimentary healthcare information system a successful tool for its physicians, whereas a sophisticated system that does not address physician demands will not maximize return on investment.

A literature review that looked at the most important acceptance factors associated with hospital information systems and related technologies from the perspectives of user groups (medical staff, hospital management, administrative personnel, patient, medical student, and information technology staff) will help researchers and hospital management develop appropriate acceptance models to improve the quality of hospital information systems (Handayani, Hidayanto, & Budi, 2018). These models will be used to improve the quality of hospital information systems. There was a search conducted using online databases that included substantial archives of scholarly articles in English that were accessible to the authors. The articles that were examined were related to hospital information systems, clinical information systems, hospital information systems, eHIS, telemedicine or telehealth, picture archiving and communication systems, radio frequency identification, and computerized physician order entry. The vast majority of these applications and technology are often employed in a fashion that is highly integrated. Evaluation and confirmation were performed on the findings obtained from the extraction of 1,005 articles that contained a certain string. This study identified 15 user acceptability characteristics linked with hospital

information systems and related technologies that were recorded in at least five preceding studies. These variables were found to be associated with user satisfaction levels. These facets were connected to personal, technological, and organizational components of the situation. In addition, the user acceptance variables for hospital information systems and other related technologies change based on the user group being served.

A recent investigation was carried out in Palestine with the purpose of investigating the advantages, qualities, and prerequisites that ought to be taken into account during the process of planning, building, developing, implementing, piloting, reviewing, maintaining, upgrading, and/or utilizing eHIS with clinical decision support systems (Shawahna, 2019). The Delphi approach and the Analytic Hierarchy Process were both incorporated into the mixed method that was used. The collection of possibly useful material began with an exhaustive literature search and continued with interviews with key contact experts totaling n = 19. We also looked into the opinions of the 76 people who participated in the panel discussion about the use of eHIS. In order to arrive to a consensus on 122 potentially important problems, a panel consisting of 76 members took part in iterative rounds of the Delphi method. The topics on which a consensus was obtained were then ordered according to their relevance using a technique called the Analytic Hierarchy Process (AHP). A consensus was obtained among the panelists on 110 (90.2%) of the 122 potentially critical subjects that were presented to them throughout the various rounds of the Delphi process. 16 (14.5%) of the items were associated with the patient's demographics, 16 (14.5%) of the items were associated with prescribing medications, 16 (14.5%) of the items were associated with checking prescriptions and alerts, 14 (12.7%) of the items were associated with the patient's identity, 13 (11.8%) of the items were associated with patient assessment, 12 (10.9%) of the items were associated with the quality of alerts, 11 (10%) of the items were associated with the admission

and discharge of the patient, The purpose of this research was to investigate the benefits, characteristics, and prerequisites that need to be taken into consideration when planning, constructing, developing, implementing, piloting, evaluating, maintaining, upgrading, and/or making use of eHIS with clinical decision assistance. Examining the topics on which a consensus was established is one way to improve the consistency and safety of using eHIS. In order to determine whether or whether these guidelines can improve patient safety and results in Palestinian hospitals, additional study is required.

In a different study that was a component of a survey that was carried out to investigate the utilization of health informatics and analyze the training requirements of health professionals in Jordan and Palestine, the authors found that the majority of health professionals in both countries were in need of additional training (Jabareen, Khader, & Taweel, 2020). In 2017, a survey was conducted in Jordan and Palestine at 14 hospitals with the purpose of analyzing the employees' utilization of the health informatics system and determining the health informatics skills that are required in both countries. The survey participants came from all health professions. The majority of respondents stated that the hospital departments they worked in made use of computer systems to facilitate service delivery. More than half of the respondents said they had had training in computer abilities, but the same number of respondents said they lacked expertise in health informatics. The percentage of respondents who were in agreement with the statement that their hospitals provide the necessary help for the operation of the HI system ranged from 58.0 to 73.6. The overwhelming majority of medical professionals, or 86.0%, answered that they needed the capability to monitor diagnoses and treatments, which also included having access to clinical findings. Additional skills required include the utilization of shared hospital services (85.6%), eHIS (84.7%), the management of electronic patient data (84.5%), the utilization of patient eHIS

in the performance of clinical research (83.4%), and the efficient utilization of tele-care services and technologies (75.9%). Education programs in the field of health informatics are strongly encouraged as a result of the requirement for training in health informatics among health professionals in Palestine and Jordan.

The implementation of an eHIS has been recognized as a significant step forward in patient care by a great number of hospitals around the world (Salameh, Eddy, Batran, Hijaz, & Jaser, 2019). If the system is successfully implemented, it will make the work of nurses easier, it will save them time, and it will improve the level of care that they deliver to patients. Despite this, there is a lack of information concerning the application of eHIS in developing countries. An investigation was carried out with the purpose of studying and evaluating the acceptance and attitudes of nurses in Palestinian hospitals towards the implementation of an eHIS. A descriptive and cross-sectional study was conducted with 191 nurses working in three government hospitals in the Palestinian territory. According to the results of the attitude survey, the vast majority of these nurses acknowledged and acknowledged the necessity of using computer-based recordkeeping. It is absolutely necessary to incorporate nurses in the planning and execution process from the very beginning. The implementation of eHIS in Palestine can be beneficial to the medical systems of other developing countries.

In the hospitals run by the Palestine Red Crescent Society, a case-mix hospital information system has been developed and is currently being put into use with the goals of assisting the network of Palestinian hospitals located in Lebanon and enhancing the health of refugees living in that country (Rossi et al., 2009). The system is dependent on the routine collection of important clinical and administrative data for each episode of hospitalization, as well as internationally accepted diagnosis codes. It is a user-friendly information system that is digitized and promotes

enhanced hospital management. Treatment quality evaluation is also made easier with this system. In addition to this, it acts as a template for the development of hospital information systems across the entirety of Lebanon and the Middle East.

Another study looked into how the adoption of the eRegistry may affect the regular health information system indicators for antenatal care (Venkateswaran et al., 2018). The goal of this study was to find out in advance how these indicators might change. The data were obtained from clinical prenatal paper records of pregnant enrollments for 2015 from 17 basic healthcare clinics located in five different districts of the West Bank. The probability selection method was used to choose the clinics. For the purpose of producing routinely reported health system indicators, we used data from clinical records pertaining to individuals. We next compared these indicators with aggregate regular health information system reports after weighting the data so that we could generate estimates at the population level. The screening rate for prenatal anemia at 36 weeks was only 20%, according to the data from clinical records, although the screening rate was 52% in routine reports. In the clinical records data, fundal height disparity was significantly more prevalent than in the routine reports (1.3% vs. 0.03%), Rh-negative blood group was 6.8% more prevalent than it was 1.4%, anemia with hemoglobin9.5 g/dL was 6% more prevalent than it was 0.6%, and malpresentation at term was 1.3% more prevalent than it was 0.03%. Only around one sixth of these instances, according to the requirements, were referred to the designated referral clinics. There is a possibility that human error, unequal denominators, or the intricacies of data methods are to blame for discrepancies between the indicators derived from the clinical records data and the regular reporting from the health information systems. Important health system indicators had a risk of underestimation because their registration was dependent on the referral of pregnant women. This created a risk of underestimation that could have serious consequences. It

will be possible for public health authorities to develop accurate health system indicators that depict the overall state of the population's health if they are able to make the switch to data collected at the individual level, as is the case with the eRegistry that is currently being put into place.

Another study was carried out with the purpose of contrasting the levels of antenatal care offered by clinics that made use of the eRegistry with those that stuck to traditional paper records (Venkateswaran et al., 2022). Primary health care clinics in the West Bank, Palestine, that provide routine prenatal care were recruited to take part in the cluster-randomized controlled trial known as eRegQual. As part of the initiative, the District Health Information Systems 2 (DHIS2) Tracker software was updated to include clinical decision assistance for antenatal care. This was done through the implementation of the eRegistry. The study included 133 clinics, which were divided into 120 clusters, and each cluster was given an equal chance of being allocated to either the control group (using paper-based recording) or the intervention group (using an electronic registry with clinical decision help). The primary process outcomes included adequate screening and management of anemia, hypertension, and diabetes during pregnancy, as well as monitoring of fetal growth and development. The most important health outcome was a composite of moderate or severe anemia; severe hypertension; large-for-gestational-age newborn; malpresentation; and small-for-gestational-age infant undetected before to birth. This was the most important health outcome at delivery. When doing the analysis of the data, clustering within clinics and pregnancies was taken into consideration by the utilization of mixed-effects logistic regression. Between the 15th of January and the 15th of September in 2017, 3,219 pregnant women received care at intervention primary health-care clinics (n = 60 clusters), while 3,148 pregnant women received care at control primary health-care clinics (n = 59 clusters). In comparison to the control group,

the intervention increased guideline adherence for screening and management of hypertension (7555 [947%] of 7982 vs 7314 [966%] of 7569; adjusted odds ratio [OR] 162 [95% confidence interval [CI] 129-2]), anemia (1535 [289%] of 5320 vs 2297 [443%] of 5182; adjusted odds ratio [OR] 188 [95% confidence interval [CI] 152-232]), and an Only 599 out of 6367 women received the full antenatal care schedule, which is a completion rate of 94%. Enhanced care provision did not result in fewer cases of poor health outcomes in the intervention clusters (700 cases; 217%), in comparison to the control clusters (688 cases; 219%; adjusted OR 099; 95% CI 087-19%). The clinical decision help used for antenatal care in the eRegistry was found to be superior for the majority of process outcomes, but it had no effect on negative health outcomes. The improvements in process results provide more evidence in favor of the WHO guideline for digital client monitoring with clinical decision support in countries with low and moderate levels of income. It's possible that achieving successful coverage could be helped along by digital health methods that target gaps in antenatal care attendance.

Another study reported the digitization and digital measurement of paper electrocardiograms, as well as their comparability with manual measurements (Holkeri et al., 2018). In 1978-1980, electrocardiograms were taken for 7203 participants in a health survey. The electrocardiograms were digitized with specific software (ECG Trace Tool) and measured digitally (EASE). Manual measurements were performed on a subsample of 100 electrocardiograms. The measurement methods demonstrated excellent agreement. The mean global (EASE)-(manual) PR interval differences were 1.4ms (95% CI: 0.5-2.2), -1.0ms (95% CI: -1.5-[-0.5]), and 11.6ms (95% CI: 10.5-12.7), respectively. RampV5, RampV6, SampV1, TampII, and TampV5 had mean inter-method amplitude differences ranging from -0.03mV to 0.01mV. The presented paper-to-digital

conversion and digital measurement method is precise and dependable, allowing for the effective storage and analysis of paper electrocardiograms.

CHAPTER THREE

Methodology

3 Methodology

3.1 Introduction to the methodology

This chapter focuses on describing the methodological procedures used in this thesis. This chapter includes a description of the study context, study design, population and sample size, study tool and data collection, pilot testing and validation of the interview guide, data analysis, and ethical considerations.

3.2 Study context

There are three main healthcare sectors in Palestine: 1) the government sector, 2) the private sector, and the United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA) sector. Hospitals in the government sector use an eHIS known as “Avicenna”. Hospitals in the private sector use different eHIS. For example, An-Najah National University Hospital uses the "CareWare ats". On the other hand, hospitals in the UNRWA sector use their own electronic HIS.

3.3 Study design

In this study, in-depth qualitative interviews in an explorative design were used. The in-depth qualitative interviews were conducted in compliance with the consolidated criteria for reporting qualitative research (COREQ) checklist (Tong, Sainsbury, & Craig, 2007).

3.4 Population and sample size

This study was conducted in governmental and private hospitals in the West Bank of Palestine. The governmental hospitals used an eHIS known as Avicenna and the private hospitals

used different eHIS. The hospitals from which the interviewees were selected were located in different large cities in the West Bank of Palestine.

The study population was composed of frequent users of the eHIS that included: 1) medical records staff, 2) physicians, 30 nurses, 3) medical laboratory staff, 4) hospital pharmacists, and 5) information technology experts who had experience in using eHIS.

Thematic saturation was used to inform the sample size needed for this study. Based on previous studies, a total of 36 in-depth qualitative interviews were needed to achieve thematic saturation in this study. The interviewees in this study were recruited using a purposive sampling technique.

3.5 Study tool and data collection

The interviews were conducted with the help of an interview guide that was developed for this study. The interview guide was developed after a literature search and review of the previous relevant studies. The interview guide included probing questions to explore the problems and challenges that healthcare professionals, managers, decision makers, and researchers face while accessing, archiving, and retrieval of the patient health information through the eHIS. The interview guide is provided in Appendix 1. The interview guide also focused on obtaining recommendations of the interviewees relevant to how the user friendliness of the eHIS can be improved to facilitate accessing, archiving, and retrieval of the patient health information. During the interviews, the sociodemographic and professional variables of the interviewees like age, gender, academic degrees, training details, professional rank, place of work, and length of practical experience were collected. Additionally, the interviewees were asked to describe their experience with the currently used eHIS in their establishment. The interview guide is provided as appendix. All interviews conducted in this study were audio-recorded.

3.6 Pilot testing and validation of the interview guide

The probing questions included in the interview guide were reviewed by the researcher (MH) and the supervisor (RS). The opinions of two other researchers were sought to ensure that the questions included in the interview guide were suitable and able to generate relevant qualitative data.

The interview guide was pilot tested with 5 employees in the archive and medical records departments to ensure that the questions were relevant and could generate relevant qualitative data. Some questions were re-worded based on the feedback from the interviews.

3.7 Data analysis

The audio recorded interviews were transcribed and their contents were analyzed thematically as described previously (Chapman, Hadfield, & Chapman, 2015; Kiger & Varpio, 2020; Vaismoradi, Turunen, & Bondas, 2013). The analysis involved data reduction, data presentation, and categorization of the qualitative data under themes.

3.8 Ethical considerations

Before conducting the qualitative interviews, an official letter was obtained from Arab American University to begin collecting data. The letter is provided as Appendix. Additionally, approval was also obtained from the Office of Health Education of the Palestinian Ministry of Health. The approval letter is provided as Appendix. From each private hospital, approval was obtained from the chief executive officer.

Before conducting the qualitative interviews, informed consent was obtained from each interviewee. The interviewees were informed that their participation was voluntary and they could

withdraw from the study at any time. The anonymity of the interviewees was guaranteed throughout the study.

3.9 Study limitations

The study has a number of perceived limitations:

- Qualitative studies are limited by approach. Qualitative studies produce qualitative data that could be merely views and opinions of the interviewees.
- Some potential interviewees might choose not to complete the interview because of their busy schedules and job requirements.
- The potential interviewees who work on shifts might be difficult to meet for an interview.
- The information that could be provided in the interviewees might not be complete, accurate, or up-to-date.
- Additionally, the interviewees might have different experiences or limited experiences with some aspects of the eHIS.

CHAPTER FOUR

Results

4 Results

4.1 Introduction to the results section

The outcomes of the qualitative data gathered from the interviews are presented in this chapter. This chapter describes the characteristics of the interviewees, views and opinions of the interviewees on the eHIS, qualitative analysis, experiences of the interviewees with the eHIS, advantages of the eHIS compared to the paper-based system, disadvantages of the eHIS compared to the paper-based system, general recommendations to improve the current eHIS, advantages to facilitate data collection for the purpose of scientific research, recommendations to improve the accuracy, security, and flexibility of data archiving and retrieval, archive and save data more efficiently and effectively than a paper document, recommendations to improve the security and confidentiality level of the eHIS, recommendations to improve archiving of patient's information, recommendations to protect the archived data from loss, and additional recommendations to improve the currently used eHIS.

4.2 Characteristics of the interviewees

Of the interviewees, more than half (66.7%) were female, 25 (69.4%) were younger than 30 years, 33 (91.7%) had bachelor's degree, 6 (16.7%) were physicians, 32 (88.9%) were employed by private hospitals, 14 (38.9%) had an experience of 5 years and more, 11 (30.6%) used the eHIS more than 50 times weekly, and 14 (38.9%) spent more than 30 hours on the eHIS weekly. The detailed characteristics of the interviewees are shown in Table 4-1.

Table 4-1: Characteristics of the interviewees (*n = 36*)

Characteristic	**n**	**%**
Age		
< 30 years	25	69.4
≥ 30 years	11	30.6
Gender		
Male	12	33.3
Female	24	66.7
Academic degree		
Diploma	2	5.6
Bachelor	33	91.7
Master	1	2.8
Job title		
Nurse	18	50.0
Physician	6	16.7
Pharmacist	1	2.8
Medical records	10	27.8
Accountant	1	2.8
Work place		
Governmental hospital	4	11.1
Private hospital	32	88.9
Years of experience at the current job		
< 5 years	22	61.1

Characteristic	n	%
≥ 5 years	14	38.9
Number of times you use the eHIS weekly		
1-50	25	69.4
51-100	8	22.2
101-150	3	8.3
Number of hours you use the eHIS weekly		
1-30	22	61.1
31-50	14	38.9

eHIS: electronic health information system

Of the interviewees, 18 (50.0%) reported that they interacted with 70 patients or more per week and 9 (25.0%) published 1 or more research papers.

The interviewees were recruited from different hospitals/clinics that belonged to the governmental, private, and UNRWA sectors. The names of the hospitals/clinics from where the interviewees were recruited are shown in Table 4-2.

Table 4-2: Hospitals/clinics from where the interviewees were recruited

Hospital	Place
An-Najah National University Hospital	Nablus
Specialized Arab Hospital	Nablus
Rafidia Surgical Hospital	Nablus
National Hospital	Nablus
Istishari Arab Hospital	Ramallah

Hospital	Place
Palestine Medical Complex	Ramallah
UNRWA clinics	Al-Ain Refugees Camp

UNRWA: The United Nations Relief and Works Agency for Palestine Refugees in the Near East

4.3 Views and opinions of the interviewees on the eHIS

When the interviewees were asked to express their views and opinions on the eHIS, the majority of the interviewees (75.0%) thought that both the eHIS and the paper-based archiving system were inflexible. Additionally, 55.6% of the interviewees reported that the currently used eHIS did not fulfill their needs. The detailed answers of the interviewees are shown in Table 4-3.

Table 4-3: Views and opinions of the interviewees on the currently used eHIS

#	Question	n	%
1	**Do you think the currently used eHIS is flexible?**		
	No	27	75.0
	Yes	9	25.0
2	**Do you think the paper-based archiving was flexible?**		
	No	27	75.0
	Yes	9	25.0
3	**Does the currently used eHIS fulfill your needs?**		
	Yes	16	44.4
	No	20	55.6

eHIS: electronic health information system

4.4 Qualitative analysis

The qualitative analysis of the interviews led to the emergence of multiple themes and subthemes. The themes include experiences of the interviewees with the eHIS, advantages of the eHIS compared to the paper-based system, disadvantages of the eHIS compared to the paper-based system, general recommendations to improve the current eHIS, advantages to facilitate data collection for the purpose of scientific research, recommendations to improve the accuracy, security, and flexibility of data archiving and retrieval, archive and save data more efficiently and effectively than a paper document, recommendations to improve the security and confidentiality level of the eHIS, recommendations to improve archiving of patient's information, recommendations to protect the archived data from loss, and additional recommendations to improve the currently used eHIS.

4.4.1 Experiences of the interviewees with the eHIS

The interviewees reported that they used the eHIS to:

- Share the health information of the patients with the different parties in the care facility to proceed with treatment procedures that the patients needed.
- Archive and retrieve all medical records data used in the care facility and coordinate with the relevant parties in this regard.
- Prepare monthly reports on the ward activities, accomplishments, observations, and work-related recommendations.
- Complete all procedures, including generating medical reports and certificates, registering fatalities, and drafting the associated notifications.
- Provide the necessary information and answer the inquiries of physicians, nurses, and patients.

4.4.2 Advantages of the eHIS compared to the paper-based system

The perceived benefits of the eHIS that were mentioned by the interviewees included:

- Retrieval of all reports related to patients electronically.
- Access to previous consultation notes and medication history.
- Creating a permanent store of patient data that is preserved from loss, and easy to save or use.
- Enable the patient to view all his medical information.
- Flexibility in designing the archiving system, divisions, and fields according to the nature of the data and the nature of the hospital's activity.
- Adopting a dynamic mechanism in the retrieval of documents to achieve direct review.
- Preventing duplication of treatment and preventing repeat requests for the same tests for the patient during the day.
- Secure messaging system for communication support between clinicians, patients, and support staff.
- Electronic ordering for prescriptions, x-ray, consults, and other diagnostic tests.
- Provision of reminders and alerts.
- Reducing human and medical errors.
- Accuracy and data privacy.
- Support for multimodal data input text, image, voice, and dictation.
- Improving patient safety and quality of health care.
- Increased doctor productivity, like scheduling appointments, ordering tests, and prescribing medications electronically.

- Appointment scheduling and patient portal access.
- Reducing the paper used to print results.
- Possibilities to study the evolution of a patient's condition.

4.4.3 Disadvantages of the eHIS compared to the paper-based system

The interviewees perceived some disadvantages of the eHIS compared to the paper-based system. The disadvantages mentioned by the interviewees included:

- The documentation process was perceived as time-consuming.
- The eHIS should be updated on a regular basis. Without regular updates, the integrity and accuracy of the records can be affected.
- Existence of design flaws that create challenges to effectively use the eHIS.
- Possibility of data leaks that might compromise the privacy of the patients.
- Possibility of losing data when transferring the data from paper-based to the eHIS.
- Installation and maintenance of an eHIS can be costly.
- The eHIS can be multiple (a system to register the patients admitted to the hospital, another system to request laboratory tests and other healthcare services, a third system for storing the notes of the healthcare providers like history and progress notes, and another system for handling images).
- Patients can have duplicated medical records.
- User friendliness issues.
- Privacy and security concerns.

4.4.4 General recommendations to improve the current eHIS

The interviewees provided the following recommendations that could be considered to improve the currently used eHIS.

- The eHIS should allow physicians and nurses to enter orders immediately into a computerized provider order entry system that can be a function within the eHIS as despite the use of eHIS, some orders are still handwritten.
- The eHIS should allow access to evidence-based information that allows healthcare professionals to provide optimal healthcare to the patients.
- The eHIS should provide reminders and alters to notify the healthcare providers that a patient is due for a health test such as mammography, cholesterol test, or an influenza vaccine.
- When a medicine to which the patient has allergy the eHIS should send a notification to the physician that a different drug is available.
- The eHIS should allow gathering all relevant information about a patient shown in one location for example, laboratory results and radiology reports.
- The eHIS should allow an easy presentation of the data or notes entered by the treating physician to the other healthcare professionals.
- The eHIS should include a function that allows correcting spelling mistakes and typos while writing.

4.4.5 Advantages to facilitate data collection for the purpose of scientific research

The interviewees stress on the importance of the eHIS for enabling collection, handling, and analysis of large datasets of patient information that can be used to inform decisions and scientific research. The interviewees mentioned the following points:

- The eHIS can provide a database that can be used in scientific research.
- The eHIS can allow preparing and maintaining monthly and annual statistical data.

- The eHIS can allow developing research capabilities of the healthcare professionals in the hospital.
- The eHIS can allow analysis of prevalence of diseases, effectiveness of treatments, and extent of the response, and if the diseases led to other symptoms.
- The eHIS can handle large samples which allow solid conclusions.
- The eHIS can improving data entry, documentation methods, data collection, and analysis.
- The eHIS can allow continuous updates on the medical records of the patients.

4.4.6 Recommendations to improve the accuracy, security, and flexibility of data archiving and retrieval

The interviewees mentioned the following recommendations that could be used to improve the accuracy, security, and flexibility of data archiving and retrieval:

- Use of indexing and retrieval techniques. The indices can be tailored to the nature of the documents, and the indexing process makes it simple to find the data you need among a large number of documents. This can save time and effort.
- Linking data in more than one database inside and outside the hospital.
- Shortening the system response time which is the time taken by an information system to respond to a specific request.
- Improving consistency of user interfaces and ease of handling.
- Improving access control to patient information.
- Conducting training workshops to increase the awareness of the medical staff on how archive patient files accurately.

- Reducing data errors, defective data, and ambiguous data.
- The use of advanced technological methods to archive patient files.
- Enabling recovery of deleted files.
- Use of a highly efficient database system.
- Support image retrieval systems.

4.4.7 Archive and save data more efficiently and effectively than a paper document

The interviewees stated that the eHIS could be used more efficiently to archive and save the data compared to the paper-based system.

- The archiving system should enable defining priorities based on the importance of the data.
- The archiving system should enable scanning, storing, and managing all documents.
- The archiving system should provide the possibility to archive all types of documents in all sizes.
- The archiving system should maintain confidentiality and enable control of files under the users' authority.
- The archiving system should enable classification of documents in a manner that is consistent with the organization's work style.
- The archiving system should enable swapping documents inside and outside the hospital.

- The archiving system should be able to assess the quality of the document and types that differ in color, size, or quality.
- The archiving system should be able to integrate with other electronic systems.
- The archiving system should enable access, search, and review of documents for an unlimited number of users.
- The archiving system should keep up with information technology developments, changes and business requirements.

4.4.8 Recommendations to improve the security and confidentiality level of the eHIS

The interviewees provided the following recommendations that can be used to improve the security and confidentiality level of the eHIS:

- Choosing a service provider that provide optimized services.
- Providing adequate training for the healthcare providers and other employees on how to effectively use the eHIS.
- Combating piracy and electronic attacks.
- Improving digital security through installation of the latest versions of virus protection programs and firewall software.
- Passwords and other "access control" measures to limit access to the information to authorized users.
- Emergency access to patient information.
- “Encrypting” stored information.
- Authentication, and access control.

- Auditing the reports.
- Automatic log-off system.
- The researchers have special permissions to access the system.

4.4.9 Recommendations to improve archiving of patient's information

The interviewees provided the following recommendations that can be used to improve archiving of patient's information:

- The possibility of direct integration with other electronic systems makes archiving data more accurate, easy, and less time and effort.
- Saving documents and data before and after modification with the ability to review documents according to the user, time and date.
- The ability to access, search and review documents for an unlimited number of users through the electronic archive system, whether through the internal network or through the Internet.
- Deleted files and access to them, and the ability to retrieve them provides a factor of security and control over documents and files.
- Guaranteed automatic scheduling to take a copy of documents and archive them periodically on a secure external storage environment such as data center.
- The ability to develop and update the archiving system to keep pace with developments and changes.
- Accessing and retrieval of archived documents and files, and displaying documents according to a specific category or template, by a specific folder, a specific user, or specific period.
- High flexibility in managing the system through backup operations.

- Generate reports and statistics.
- Make the best decisions possible based on accurate and current information.
- The ability to export reports to (MS Word) and (Excel MS) files.

4.4.10 Recommendations to protect the archived data from loss

The interviewees provided the following recommendations that could be used to protect the archived data from loss:

- Generation of a data center.
- Providing multiple access points to the eHIS.
- Managing all types of documents and files according to standardized methods.
- Backup media containing basic or sensitive information is placed at a safe distance from the main site to avoid damage from a disaster in the main site.
- The possibility of the patient obtaining a copy of the file for presentation to doctors from outside the hospital.
- Archive files regularly on a daily basis and not accumulate them, which causes them to be lost.
- Setting up a patient file management strategy that defines file name standards, archiving and retrieval, and access is the best method to tackle this difficulty.
- Paper-based files are typically associated with significant time waste. It is prohibitively expensive to maintain, store, search. Organizations are losing ground if they continue to rely on paper documentation for day-to-day operations.
- At any point, the system should be able to determine the status of the eHIS, what changes have been made, and whether it has been shared patient data with other healthcare providers.

- Create a system for analyzing all patient data, such as laboratory tests and ECG exam papers, and X-ray images.
- Control of modifications to the patient's electronic file.
- Auditing the patient’s file in the department daily by the medical records officer.
- Notifying the doctor of the damaged documents and approving new alternative documents.
- Duplicate papers or printed more than once and stored automatically on the electronic system must be disposed of.
- Checklist sheet to hand over files and write lost or damaged documents on it.
- Keep the paper file in a suitable place that contains all safety procedures, fire extinguishing.
- Provide files with good qualities to save papers from damage or scattering and keep them in an appropriate environment.
- Providing spaces for storing unlimited paper documents in a suitable environment.
- Possibility to view old versions of documents.

4.4.11 Additional recommendations to improve the currently used eHIS

The interviewees provided the following recommendations to improve the currently used eHIS.

- There is only one folder for the archive. Each visit the patient is stored in this folder.
- Hospitals should always maintain their system servers online. It should also contain backup servers and databases so that if the primary server fails, there is a backup server that can perform the same functions.
- If the Internet is interrupted, cannot access data.

- Electronic signature authenticity.
- Cost for electronic archiving.
- Employees create many barriers that make using the e-health system difficult; as a result, hospitals should stay up with technology advancements that improve their work.
- Hospitals should have an interest in system users by giving them more training or giving them information about the benefits that can be gain through using e-medical records.
- Palestinian hospitals should adopt all forms of e-health services.
- Hospitals should focus more on defining technical and medical personnel.
- Capable of interacting with devices and systems, as well as resolving issues that may arise while conducting tasks.
- Failure to clarify the scientific name of the drugs on the system.
- The difference and diversity of documents such as sizes, colors, and quality of digital images entered.
- There are no drop-down lists to specify the data for creating reports.

CHAPTER FIVE

Discussion

5 Discussion

This chapter discusses the findings of the findings, draws a conclusion based on the findings of the study, and provides recommendations to decision makers and developers of eHIS to improve the user friendliness and effectiveness of the currently used eHIS in Palestinian hospitals.

The interviewees in this research emphasized the importance of eHIS in improving healthcare services provided to the patients. The interviewees in this study stressed on the need to improve and upgrade the eHIS in order to make the task of healthcare providers easier, particularly in terms of archiving and retrieving of patient health information, accessing patient health information, ensuring adherence to guidelines and protocols, improving patient health information sharing, reducing paper-based work, and focusing on designing effective user interfaces.

Several obstacles that healthcare providers experienced when providing health care services in hospitalized patient settings were emphasized. These obstacles may have hindered healthcare practitioners' ability to gather data, retrieve stored data, and improve patient health outcomes. These findings reported in this qualitative study might serve as a call to decision-makers in healthcare authorities to improve the currently used eHIS.

5.1 Discussion of the main findings

In this study, the majority of the interviewees thought that the archiving systems used in the Palestinian hospitals were inflexible. Moreover, more than half of the interviewees felt that the currently used eHIS did not fulfill their needs. The findings reported in this study might reflect the lack of user friendliness and effectiveness of the currently used eHIS in the Palestinian hospitals. Previous studies reported that the eHIS should facilitate the tasks of the healthcare providers and

decision makers in the healthcare system (Agrawal et al., 2022; Quinn et al., 1997). Taken together, these findings indicate that the user friendliness and effectiveness of the currently used eHIS need to be improved (Shawahna, 2019).

The interviewees in this study indicated that they used the eHIS to archive, retrieve, and share patients' health information. This should have facilitated their routine activities. In different healthcare systems around the world, eHIS was introduced to replace the paper-based archiving systems (Handayani et al., 2018; Jabareen et al., 2020; Shawahna, 2019). Compared to the paper-based archiving systems, the eHIS provides important advantages by allowing retrieval of the patients' health information electronically. This should allow more rapid access to complete history, laboratory findings, and ordering healthcare services electronically. The advantages mentioned by the interviewees in this study were consistent with those reported in previous studies (Agrawal et al., 2022; Handayani et al., 2018; Holkeri et al., 2018; Jabareen et al., 2020; Quinn et al., 1997; Rossi et al., 2009; Salameh et al., 2019; Shawahna, 2019). On the other hand, the interviewees in this study stated that there were disadvantages with the use of eHIS compared to the paper-based systems. Therefore, decision makers and developers of eHIS should consider the views, opinions, and recommendations of the end users to improve the currently used eHIS (Shawahna, 2019).

The interviewees in this study provided valuable recommendations to improve the currently used eHIS. These recommendations included elimination of the use of handwritten orders, access to evidence-based health information to facilitate provision of optimal healthcare services, provision of reminds and alerts, collating all patient information into a complete report, easier presentation of all data and notes, and correcting spelling and typos. These recommendations might improve the quality of the healthcare provided to the patients admitted to the Palestinian

hospitals (Handayani et al., 2018; Jabareen et al., 2020; Rossi et al., 2009; Salameh et al., 2019; Shawahna, 2019; Venkateswaran et al., 2018).

In this study, the interviewees mentioned many valuable recommendations that can be used to improve the use of the eHIS to collect data for scientific research. Collection of data for scientific research can be time-consuming. The eHIS allows collecting, handling, and presenting large data. This should facilitate dissemination of results relevant to prevalence of diseases, effectiveness of treatments, and extent of the response to certain therapies. The findings of this study were consistent with those reported in a previous study which proposed the use of the eHIS to facilitate conducting clinical research studies (Cowie et al., 2017).

The interviewees provided additional recommendations to improve archiving, easy retrieval of the patients' health information, protection, security and confidentiality of the patients' information. It is important for decision makers and developers of eHIS to consider these recommendations to improve the currently used eHIS.

5.2 Appraisal of the strengths of the study

The current study had a number of strengths that should be considered when interpreting the findings reported. These strengths include:

- The interviewees who participated in this study had an adequate length of experience in dealing with the eHIS used in the Palestinian healthcare system. This should have allowed gathering rich qualitative data that was analyzed and included in this study.
- The interviewees had diverse sociodemographic characteristics, profession, academic degrees, work experience, geographical location of their workplace, and experience in using the eHIS. This should have diversified the qualitative data collected in this study.

5.3 Conclusion

In conclusion, healthcare professionals (physicians, nurses, and pharmacists) and medical records staff were generally satisfied with the user friendliness and effectiveness of the currently used eHIS in Palestinian hospitals. Despite some disadvantages, the interviewees in this study stated that the eHIS provided advantages over the paper-based archiving systems. The interviewees provided recommendations that can be used to improve the user friendliness, effectiveness of the eHIS in facilitating archiving and retrieval of patients' health information, collection of data for scientific research, accuracy, security, confidentiality, and flexibility of data archiving and retrieval. These findings might be informative and developers of eHIS to improve the currently used eHIS in Palestinian hospitals.

5.4 Recommendations

Based on the findings of this study, the following recommendations can be made:

1. There is a need to improve the user friendliness and effectiveness of the currently used eHIS in the Palestinian hospitals.
2. There is a need to develop and improve the capabilities of the data center and information technology department.
3. The healthcare system should keep up with the technological advancements in the healthcare field and hospitals should allocate funds and resources to improve and upgrade the currently used eHIS.

5.5 Future work

- More studies are still need to investigate the impact of improving and upgrading the currently used eHIS on the quality of healthcare services provided to the patients cared for and scientific/clinical research conducted in the Palestinian hospitals.

References

Agrawal, P. K. B., Giri, B., Gupta, P., Khatri, R., & Devkota, S. (2022). Integrated Electronic Health Record System in a Tertiary Care Centre: A Single Centre Implementation Experience. *JNMA J Nepal Med Assoc, 60*(248), 413-415. doi:10.31729/jnma.7445

Chapman, A. L., Hadfield, M., & Chapman, C. J. (2015). Qualitative research in healthcare: an introduction to grounded theory using thematic analysis. *J R Coll Physicians Edinb, 45*(3), 201-205. doi:10.4997/jrcpe.2015.305

Cowie, M. R., Blomster, J. I., Curtis, L. H., Duclaux, S., Ford, I., Fritz, F., . . . Zalewski, A. (2017). Electronic health records to facilitate clinical research. *Clin Res Cardiol, 106*(1), 1-9. doi:10.1007/s00392-016-1025-6

Handayani, P. W., Hidayanto, A. N., & Budi, I. (2018). User acceptance factors of hospital information systems and related technologies: Systematic review. *Inform Health Soc Care, 43*(4), 401-426. doi:10.1080/17538157.2017.1353999

Holkeri, A., Eranti, A., Kenttä, T. V., Noponen, K., Haukilahti, M. A. E., Seppänen, T., . . . Huikuri, H. V. (2018). Experiences in digitizing and digitally measuring a paper-based ECG archive. *J Electrocardiol, 51*(1), 74-81. doi:10.1016/j.jelectrocard.2017.09.007

Jabareen, H., Khader, Y., & Taweel, A. (2020). Health information systems in Jordan and Palestine: the need for health informatics training. *East Mediterr Health J, 26*(11), 1323-1330. doi:10.26719/emhj.20.036

Kiger, M. E., & Varpio, L. (2020). Thematic analysis of qualitative data: AMEE Guide No. 131. *Med Teach, 42*(8), 846-854. doi:10.1080/0142159x.2020.1755030

Lippeveld, T., Sauerborn, R., Bodart, C., & Organization, W. H. (2000). *Design and implementation of health information systems*: World Health Organization.

Quinn, M. M., Weber, B., & Ciotti, V. G. (1997). Is your healthcare information system physician friendly? *Healthc Financ Manage, 51*(6), 62-68.

Rosewell, A., Shearman, P., Ramamurthy, S., & Akers, R. (2021). Transforming the health information system using mobile and geographic information technologies, Papua New Guinea. *Bull World Health Organ, 99*(5), 381-387a. doi:10.2471/blt.20.267823

Rossi, L., Materia, E., Hourani, A., Yousef, H., Racalbuto, V., Venier, C., & Osman, M. (2009). Design and implementation of a hospital information system for the Palestine Red Crescent Society in Lebanon. *East Mediterr Health J, 15*(3), 738-746.

Salameh, B., Eddy, L. L., Batran, A., Hijaz, A., & Jaser, S. (2019). Nurses' Attitudes Toward the Use of an Electronic Health Information System in a Developing Country. *SAGE Open Nurs, 5*, 2377960819843711. doi:10.1177/2377960819843711

Shawahna, R. (2019). Merits, features, and desiderata to be considered when developing electronic health records with embedded clinical decision support systems in Palestinian hospitals: a consensus study. *BMC Med Inform Decis Mak, 19*(1), 216. doi:10.1186/s12911-019-0928-3

Sheikh, A., Anderson, M., Albala, S., Casadei, B., Franklin, B. D., Richards, M., . . . Mossialos, E. (2021). Health information technology and digital innovation for national learning health and care systems. *Lancet Digit Health, 3*(6), e383-e396. doi:10.1016/s2589-7500(21)00005-4

Sheikh, A., Sood, H. S., & Bates, D. W. (2015). Leveraging health information technology to achieve the "triple aim" of healthcare reform. *J Am Med Inform Assoc, 22*(4), 849-856. doi:10.1093/jamia/ocv022

Sittig, D. F., Wright, A., Coiera, E., Magrabi, F., Ratwani, R., Bates, D. W., & Singh, H. (2020). Current challenges in health information technology-related patient safety. *Health Informatics J, 26*(1), 181-189. doi:10.1177/1460458218814893

Thompson, T. G., & Brailer, D. J. (2004). The decade of health information technology: delivering consumer-centric and information-rich health care. *Washington, DC: US Department of Health and Human Services*.

Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care, 19*(6), 349-357. doi:10.1093/intqhc/mzm042

Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nurs Health Sci, 15*(3), 398-405. doi:10.1111/nhs.12048

Venkateswaran, M., Ghanem, B., Abbas, E., Khader, K. A., Ward, I. A., Awwad, T., . . . Frøen, J. F. (2022). A digital health registry with clinical decision support for improving quality of antenatal care in Palestine (eRegQual): a pragmatic, cluster-randomised, controlled, superiority trial. *Lancet Digit Health, 4*(2), e126-e136. doi:10.1016/s2589-7500(21)00269-7

Venkateswaran, M., Mørkrid, K., Abu Khader, K., Awwad, T., Friberg, I. K., Ghanem, B., . . . Frøen, J. F. (2018). Comparing individual-level clinical data from antenatal records with routine health information systems indicators for antenatal care in the West Bank: A cross-sectional study. *PLoS One, 13*(11), e0207813. doi:10.1371/journal.pone.0207813

Williams, F., Oke, A., & Zachary, I. (2019). Public health delivery in the information age: the role of informatics and technology. *Perspect Public Health, 139*(5), 236-254. doi:10.1177/1757913918802308

Yusof, M., & Sahroni, M. N. (2018). Investigating health information systems-induced errors. *Int J Health Care Qual Assur, 31*(8), 1014-1029. doi:10.1108/ijhcqa-07-2017-0125

Appendices

Appendix 1: The interview guide

الجامعة العربية الأمريكية
ARAB AMERICAN UNIVERSITY

كلية الدراسات العليا

قسم العلوم الصحية

ماجستير في المعلوماتية الصحية

تهدف هذه المقابلة الى الاجابة عن الاسئلة التالية :

1. العمر:
2. الجنس:
3. الشهادات الجامعية (جميعها مع الدورات والاختصاص):
4. المسمى الوظيفي:
5. مكان العمل:
6. عدد سنوات الخبرة في الموقع الحالي:
7. الخبرات السابقة:
8. العدد الاجمالي لسنوات الخبرة:3
9. الخبرات البحثية:
10. عدد الابحاث المنشورة/قيد النشر:
11. عدد المرضى التقريبي الذين تتعامل معهم اسبوعيا:
12. عدد المرات التي تتعامل معها مع النظام اسبوعيا:
13. عدد الساعات التقريبي التي تقضيها بالتعامل مع النظام اسبوعيا:

---

1. حدثنا عن تجربتك مع النظام الالكتروني للسجلات الطبية في المستشفى؟
   ما هي الفوائد/الميزات التي جلبها النظام الالكتروني للسجلات الطبية في المستشفى مقارنة مع النظام الورقي؟
2. ما هي سلبيات النظام الالكتروني بشكل عام مقارنة مع النظام الورقي؟
3. يعاني بعض المستخدمين من طاقم طبي وباحثين مع النظام الحالي، خصوصا اثناء عملية البحث عن واسترجاع وتعديل بيانات ومعلومات المرضى الطبية، بلاشك، هناك الكثير مما يمكن فعله لتحسين النظام الحالي للسجلات الطبية في المستشفى. برأيك ما الذي تتمنى تغييره على النظام لزيادة كفاءة توفير الوقت والجهد على المستخدمين من طاقم طبي وباحثين لاسترجاع وتعديل بيانات المرضى ومعلوماتهم الطبية؟
4. برأيك هل نظام الارشفة التقليدي غير مرن؟ هل يتناسب مع التغييرات المستمرة التي تتطلب نظاما مرنا؟ وهل يلبي النظام الحالي احتياجاتك؟ مالذي تتمنى فعله لتحسين/زيادة الدقة والامان والمرونة لارشفة واسترجاع البيانات؟ كيف يمكننا ارشفة البيانات وحفظها بشكل اكثر كفاءة وفعالية من المستند الورقي ؟
5. ما هي المزايا التي يمكن/تتمنى اضافتها على هذا النظام حتى يصبح بشكل افضل مما هو عليه الان ولتسهيل جمع البيانات بهدف البحث العلمي او عرضها على الادارة لاتخاذ قرارات معينة؟
6. من اهم المشاكل التي تواجهها عملية توثيق الملفات تشتت الوثائق والمستندات. برأيك، كيف يمكن تغيير النظام لمعالجة تلك المشكلة؟ ما الذي تتمنى تغييره؟
7. كيف يمكن المحافظة على هذه البيانات من التلف او الفقدان في عملية الارشفة ؟
8. كيف يمكن الحفاظ على سرية وخصوصية البيانات اثناء ارشفتها واسترجاعها ورفع مستوى الامان والحماية للبيانات ؟
9. باعتقادك كيف تكون السجلات الطبية (ارشفة الملفات واسترجاعها) ملائمة لطبيعة عملك / طريقة بحثك في المجال الطبي
10. حدثنا اكثر عن المشاكل والعقبات المتعلقة بالنظام الحالي؟ هل هناك مشاكل لم يتم التطرق اليها في الاسئلة اعلاه؟ ما الذي تتمنى تغييره على النظام الحالي؟

Appendix 2: Study approval by the Faculty of Graduation Studies of the Arab American University

Arab American University
Faculty of Graduate Studies

الجامعة العربية الأمريكية
كلية الدراسات العليا

Study title: **"Improving researcher friendliness in archiving and retrieval of patient health information in currently used health information systems in Palestinian hospitals"**

Submitted By:

Student's Name: Mustafa Herzallah
Supervisor: Dr. Ramzi Shawahneh
Co-advisor: __

Date Reviewed:

15 April 2021

Date approved:

1 June 2021

Study titled: "**Improving researcher friendliness in archiving and retrieval of patient health information in currently used health information systems in Palestinian hospitals**" was reviewed by AAUP research committee for research and ethical principles and was approved on **1 June 2021**.

Dr. Shahenaz Najjar

Dean of Graduate studies

كلية الدراسات العليا
FACULTY OF GRADUATE STUDIES

Appendix 3: Approval to start collecting the data

Arab American University
Faculty of Graduate Studies

الجامعة العربية الأمريكية
كلية الدراسات العليا

2021-10-9

حضرة د. كمال حجازي المحترم

مدير مستشفى النجاح الوطني الجامعي

تسهيل مهمة بحثية

تحية طيبة وبعد،

تهديكم كلية الدراسات العليا في الجامعة العربية الامريكية اطيب التحيات، وبالإشارة الى الموضوع أعلاه، تشهد كلية الدراسات العليا في الجامعة أن الطالب **مصطفى هشام مصطفى حرزالله** والذي يحمل الرقم الجامعي 201812862 وهو طالب ماجستير في الجامعة العربية الامريكية تخصص المعلوماتية الصحية، ويعمل على رسالة بعنوان **" Improving researcher friendliness in archiving and retrieval of patient health information in currently used health information systems in Palestinian hospitals"**. نأمل من حضرتكم الايعاز لمن يلزم لمساعدته في الحصول على المعلومات اللازمة للدراسة، علما" ان المعلومات ستستخدم لغاية البحث فقط وسيتم التعامل معها بغاية السرية، وقد أعطيت هذه الرسالة بناء" على طلبه.

وتفضلوا بقبول فائق الاحترام

د. شاهيناز نجار

عميد كلية الدراسات العليا

كلية الدراسات العليا
FACULTY OF GRADUATE STUDIES

Appendix 4: A letter from the Arab American University to facilitate collecting the data

Arab American University
Faculty of Graduate Studies

الجامعـــة العربيـــة الأمريكيـــة
كلية الدراسات العليا

2021-11-10

حضرة د. عبد الله القواسمي المحترم

رئيس وحدة التعليم الصحي والبحث العلمي/ وزارة الصحة الفلسطينية

تسهيل مهمة بحثية

تحية طيبة وبعد،

تهديكم كلية الدراسات العليا في الجامعة العربية الامريكية اطيب التحيات، وبالإشارة الى الموضوع أعلاه، تشهد كلية الدراسات العليا في الجامعة أن الطالب **مصطفى هشام مصطفى حرزالله** والذي يحمل الرقم الجامعي 201812862 وهو طالب ماجستير في الجامعة العربية الامريكية تخصص المعلوماتية الصحية، ويعمل على رسالة بعنوان **" Improving researcher friendliness in archiving and retrieval of patient health information in currently used health information systems in Palestinian hospitals"**. نأمل من حضرتكم الايعاز لمن يلزم لمساعدته في الحصول على المعلومات اللازمة للدراسة، علما" ان المعلومات ستستخدم لغاية البحث فقط وسيتم التعامل معها بغاية السرية، وقد أعطيت هذه الرسالة بناء" على طلبه.

وتفضلوا بقبول فائق الاحترام

د. شاهيناز نجار

عميد كلية الدراسات العليا

كلية الدراسات العليا
FACULTY OF GRADUATE STUDIES

Appendix 5: Approval of the Directorate of Education in Health and Scientific Research in the Ministry of Health to facilitate collecting the data

State of Palestine
Ministry of Health
General Directorate of Education in Health and Scientific Research

دولة فلسطين
وزارة الصحة
الإدارة العامة للتعليم الصحي والبحث العلمي

Ref.: ....
Date:..................

الرقـــم: ٢٠٢١/٤٩/١٦٢
التـاريخ: ٦/١١/٢٠٢١

الأخ مدير عام الادارة العامة للمستشفيات المحترم،،،

تحية واحترام...

الموضــوع: تسهيل مهمة بحث

يرجى التكرم بتسهيل مهمة الطالب: **مصطفى حرزالله، ماجستير معلوماتية صحية- الجامعة العربية الامريكية،** لعمل بحث بعنوان:

Improving researcher friendliness in archiving and retrieval of patient " health information in currently used health information systems in " Palestinian hospitals: a mixed method

حيث سيقوم الطالب بجمع معلومات من خلال عمل مقابلات وتعبئة استبانة من قبل الموظفين بعد اخذ موافقتهم، مع العلم أن مشرف الدراسة: د. رمزي شواهنه.

وذلك في: **المستشفيات الحكومية في شمال الضفة الغربية**

على ان يتم الالتزام بالمحافظة على اخلاقيات البحث العلمي وسرية المعلومات.
على ان يتم الالتزام بجميع تعليمات واجراءات الوقاية والسلامة الصادرة عن وزارة الصحة بخصوص جائحة كورونا، وتحت طائلة المسؤولية. وابراز شهادة التطعيم قبل دخول مرافق وزارة الصحة.
على ان يتم تزويد الوزارة بنسخة PDF من نتائج البحث، التعهد بعدم النشر لحين الحصول على موافقة وزارة الصحة.

مع الاحترام...

د. عبد الله القواسمي
مدير التعليم الصحي والبحث العلمي

نسخة: عميد كلية الدراسات العليا المحترم/ الجامعة العربية الامريكية

Appendix 6: Approval from another hospital

Arab American University
Faculty of Graduate Studies

الجامعة العربية الأمريكية
كلية الدراسات العليا

2021-10-9

حضرة د. كمال حجازي المحترم

مدير مستشفى النجاح الوطني الجامعي

تسهيل مهمة بحثية

تحية طيبة وبعد،

تهديكم كلية الدراسات العليا في الجامعة العربية الامريكية اطيب التحيات، وبالإشارة الى الموضوع أعلاه، تشهد كلية الدراسات العليا في الجامعة أن الطالب **مصطفى هشام مصطفى حرزالله** والذي يحمل الرقم الجامعي 201812862 وهو طالب ماجستير في الجامعة العربية الامريكية تخصص المعلوماتية الصحية، ويعمل على رسالة بعنوان **" Improving researcher friendliness in archiving and retrieval of patient health information in currently used health information systems in Palestinian hospitals"**. نأمل من حضرتكم الايعاز لمن يلزم لمساعدته في الحصول على المعلومات اللازمة للدراسة، علما" ان المعلومات ستستخدم لغاية البحث فقط وسيتم التعامل معها بغاية السرية، وقد أعطيت هذه الرسالة بناء" على طلبه.

وتفضلوا بقبول فائق الاحترام

د. شاهيناز نجار

عميد كلية الدراسات العليا

كلية الدراسات العليا
FACULTY OF GRADUATE STUDIES

إدارة الطبية
NUH
Medical Management

Jenin Tel: +970-4-2418888 Ext.:1471,1472 Fax: +970-4-2510810 P.O. Box:240
Ramallah Tel: +970-2-2941999 Fax: +970-2-2941979 Abu Qash - Near Alrehan
E-mail: FGS@aaup.edu ; PGS@aaup.edu Website: www.aaup.edu

الملخص

خلفية الدراسة: حاليًا ، تستخدم المستشفيات والعيادات ومراكز الصحة المجتمعية والرعاية الصحية الأولية الحكومية وكذلك الخاصة نوعًا من نظام المعلومات الصحية الإلكترونية لإدارة المعلومات الصحية وأرشفتها. الهدف العام من هذه الدراسة هو الحصول على توصيات لتحسين سهولة الاستخدام في أرشفة واسترجاع المعلومات الصحية للمرضى في نظام المعلومات الصحية الإلكتروني المستخدم حاليًا في المستشفيات الفلسطينية.

الطريقة: في هذه الدراسة ، تم استخدام المقابلات النوعية المتعمقة. تم إجراء المقابلات النوعية المتعمقة وفقًا للمعايير الموحدة للبحث النوعي. أجريت المقابلات بمساعدة دليل المقابلة الذي تم تطويره لهذه الدراسة. تم تجنيد من تمت مقابلتهم من مستشفيات / عيادات مختلفة تابعة للقطاع الحكومي والخاص وقطاع الأونروا. تم نسخ المقابلات الصوتية المسجلة وتحليل محتواها حسب الموضوع.

النتائج: كان أكثر من نصف المشاركين (66.7٪) من الإناث ، 25 (69.4٪) تقل أعمارهم عن 30 سنة ، 33 (91.7٪) حاصلون على درجة البكالوريوس ، 6 (16.7٪) أطباء ، 32 (88.9٪) يعملون في المستشفيات الخاصة ، 14 (38.9٪) لديها خبرة 5 سنوات فأكثر ، 11 (30.6٪) استخدم نظام المعلومات الصحية الإلكتروني أكثر من 50 مرة أسبوعياً ، و 14 (38.9٪) قضوا أكثر من 30 ساعة على نظام المعلومات الصحية الإلكتروني بشكل أسبوعي. عندما طُلب من الأشخاص الذين تمت مقابلتهم التعبير عن آرائهم حول نظام المعلومات الصحية الإلكتروني ، اعتقد غالبية الأشخاص الذين تمت مقابلتهم (75.0٪) أن نظام المعلومات الصحية الإلكتروني ونظام الأرشفة الورقي غير مرن. بالإضافة إلى ذلك ، أفاد 55.6٪ من الأشخاص الذين تمت مقابلتهم أن نظام المعلومات الصحية الإلكتروني المستخدم حاليًا لا يلبي احتياجاتهم. أدى التحليل النوعي للمقابلات إلى ظهور مواضيع ومواضيع فرعية متعددة. تشمل المحاور خبراتهم بالتعامل مع نظام المعلومات الصحية الإلكتروني ، ومزايا نظام المعلومات الصحية الإلكتروني مقارنة بالنظام الورقي ، وعيوب نظام المعلومات الصحية الإلكتروني مقارنة بالنظام الورقي ، وتوصيات عامة لتحسين نظام المعلومات الصحية الإلكتروني ، مزايا لتسهيل جمع البيانات لغرض البحث العلمي ، توصيات لتحسين دقة وأمن ومرونة أرشفة البيانات واسترجاعها ، أرشفة وحفظ البيانات بشكل أكثر كفاءة وفعالية من المستند الورقي ، توصيات لتحسين مستوى الأمان والسرية لنظام المعلومات الصحية الإلكتروني ، توصيات لتحسين أرشفة معلومات المريض ، توصيات لحماية البيانات المؤرشفة من الضياع ، وتوصيات إضافية لتحسين نظام المعلومات الصحية الإلكتروني المستخدم حاليًا.

الخلاصة: المتخصصون في الرعاية الصحية (الأطباء والممرضات والصيادلة) وموظفو السجلات الطبية غير راضين بشكل عام عن سهولة الاستخدام وفعالية نظام المعلومات الصحية الإلكتروني المستخدم حاليًا في المستشفيات الفلسطينية. على الرغم من بعض العيوب ، ذكر الأشخاص الذين تمت مقابلتهم في هذه الدراسة أن نظام المعلومات الصحية الإلكتروني يوفر مزايا مقارنة بأنظمة الأرشفة الورقية. قدم الأشخاص الذين تمت مقابلتهم توصيات يمكن استخدامها لتحسين سهولة الاستخدام ، وفعالية نظام المعلومات الصحية الإلكتروني في تسهيل أرشفة واسترجاع المعلومات الصحية للمرضى ، وجمع البيانات للبحث العلمي ، والدقة ، والأمان ، والسرية ، ومرونة أرشفة البيانات. والاسترجاع. قد تكون هذه النتائج مفيدة ومطورين لنظام المعلومات الصحية الإلكترونية لتحسين نظام المعلومات الصحية الإلكترونية المستخدم حاليًا في المستشفيات الفلسطينية.

الكلمات المفتاحية: نظام المعلومات الصحية الإلكتروني ، المعلوماتية الصحية ، المستشفيات ، الأرشفة ، الاسترجاع ، سلامة المرضى