IMPROVING PATIENT REFERRAL PROCESSES THROUGH ELECTRONIC HEALTH RECORD SYSTEM: A CASE STUDY OF RURAL HOSPITALS IN LIMPOPO PROVINCE

by

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submitted in accordance with the requirements

for the degree of

Magister Technologiae

in the subject

Information Technology

at the

University of South Africa

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November 2013

Declaration

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I declare that Improving Patient Referral Processes Through Electronic Health Record System: A Case Study of Rural Hospitals in Limpopo Province is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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SIGNATURE DATE

(Mrs)

Abstract

In the last decade, the deployment of Electronic Health Records has increased tremendously in many developed countries. This increasing trend intensifies the need for developing countries like South Africa to implement electronic health record systems in state owned hospitals to facilitate e-referral processes to improve health care delivery.

The aim of this research was to investigate the current process of patient record keeping, management, and the referral process of patients within the same hospital and to other hospitals and based on the findings compile an Electronic Health Record (EHR) framework to facilitate e- referral processes.

This research study was based on a qualitative case study approach. A multiple data collection technique was used which included group interviews, questionnaires, document analysis and informal discussions with the hospital workers. Data were analysed by categorization and thematic approach.

The findings obtained from state hospitals indicated that there is no EHR system which accommodates patient health record systems to facilitate e-referral processes. These findings led to a compilation of the Limpopo Electronic Health Record System (LEHRS) to aid e-referral processes in state hospitals. The increasing need for accurate, reliable, available and accessible EHR will be addressed by the implementation of LEHRS as information will be stored in a central database in a useable format and will be easily accessed.

Key words: *Electronic health record; Patient record; Record keeping; Electronic referral; e-Referral framework; Patient referral processes; Health information system*

Acknowledgements

I am very grateful for the contribution of several people who made this research study possible. It would not have been possible without their help. It is so fulfilling to say thank you to the following people: Dr Alfred Coleman, my supervisor, for his continuous support and providing valuable advice throughout the research study. Thank you for showing me the light and accommodating me in your busy schedule.

A very special thank you to the Limpopo Department of Health for the permission granted to conduct the study within your hospitals and for the support and contribution towards this research.

The representatives of Elim Hospital, Tshilidzini Hospital and Donald Fraser Hospital for the permission granted to conduct the study within your organisation. I further thank you for your support and the interest shown in the study.

EOH, allow me to thank you for funding the study, study leave and your encouragement, which fuelled me to propel forward throughout the research study.

Thank you to my husband, Hadzhi for sustaining a positive environment throughout my studies and to my baby Anda for being a good baby making it possible for me to complete the research on time. It is your support and attitude that kept me going.

To my nanny vhoEllisa, I say thank you for looking after my two month old baby, your support kept me sane and made this research possible.

Above all I give thanks to the almighty God for the strength and wisdom.

Dedication

I dedicate this research to my father, Risimati Ephraim Mkhabela, and mother, Suzan Tsakani Mkhabela; thank you for the positive and disciplined upbringing. The strong foundation you laid made me who I am today. Lastly to the entire Nevhutalu and Mkhabela family, I say thank you.

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LIST OF ABRÉVIATIONS

BI: Behavioural Intention

cf: Abbreviation used for referring to something that is connected with the subject

CHI: Canada Health Infoway

DHS: Department of Human Services

DOHSA: Department of Health South Africa

EHR: Electronic Health Records

EDI: Electronic Data Interchange

ELIN: Electronic Information Exchange

ERS: Electronic Record Systems

HIMSS: Health Information Management Systems Society

HIS: Health Information System

HPCSA: Health Professions Council of South Africa

HR: Human Resources

ICT: Information Communications Technology

IHE: Integrating the Healthcare Enterprise

IOM: Institute of Medicine

LEHRS: Limpopo Electronic Health Record System

MGMA: Medical Group Management Association

MPS: Medical Protection Society

NAHIT: National Alliance for Health Information Technology

NEHTA: National E-Health Transition Authority

NSDA: National Service Delivery Agreement

PCC: Patient Care Coordination

PEHF: Provincial e-Health Framework

TAM: Technology Acceptance Model

CHAPTER 1: INTRODUCTION TO THE STUDY

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CHAPTER 1

INTRODUCTION TO THE STUDY

1.1 Introduction

Information Technology has become one of the major tools available to many organizations for achieving operational excellence and competitive advantage (Laudon and Laudon, 2012). The healthcare industry in South Africa has acknowledged the potential of information technology systems such as Electronic Health Records and has embarked on Information Communications Technology (ICT) projects to implement national EHR as part of the national e-Health Strategy, Department of Human Services (DHS), 2006). The aim of this project is to improve the quality of management of patient records to ease the referring process of patients from one department to another within the same hospital or referrals of patients from one hospital to another. The process of referring a patient from one department/hospital to the other using electronic health records is called e-referral. E-referral is an electronic document, such as a text document or PDF, transmitted in support of the referral of the patient (Department of Human Services, 2006). In this research, e-referral means an electronic communication, with the intention of initiating care transfer, from the provider making the referral to the receiver, using the internet.

Electronic Health Record is an evolving concept defined as a systematic collection of electronic health information about individual patients or populations. It is a record in digital format that is theoretically capable of being shared across different health care settings. In some cases this sharing can occur by way of network-connected, enterprise-wide information systems and other networks or exchanges. EHRs may include a range of data, including demographics, medical history, medication and allergies, immunization status, laboratory test results, radiology images, vital signs, personal stats like age and weight, and billing information. (Gunter & Terry, 2005) this simply means enabling sharing of patient data between points of care.

Most hospitals currently use manual paper based processes for recording and storing patient records which increase errors, inconsistency and lack of security which sometimes result in loss of patient files. Only a third of all provincial hospitals have some form of functioning electronic health record system. There are several other ICT systems in place in the rural hospitals but they are not linked to foster interoperability.

This research aims to investigate how public hospitals in Limpopo Province currently manage patient health records and patient referral processes within the same hospital and to other hospitals.

1.2 Problem Statement

The National Department of Health (DoH) has installed computers in rural hospitals with the aim of facilitating the keeping of patient health records electronically (DoH, 2008). These electronic health records form part of the e-Health National Strategy Project that the DoH is attempting to implement. (DoH, 2008). The problem is, despite the investment by the DoH to improve the keeping of patient health records to aid patients who are referred from one hospital to the other, move with their paper records which are sometimes lost or stolen.

As a result of the challenges stated above, it is imperative to investigate the processes of keeping patient records in Shayandima Hospital, Tshilidzini Hospital and Donald Fraser Hospital in Limpopo Province and based upon the findings propose an Electronic Health Record system to aid the e-Referral process.

1.3 Research Questions

Based on the research problem as expressed above the following research question and sub-questions were articulated.

How can patients' referral processes be improved through the use of electronic health record systems at hospitals in Limpopo?

Sub- questions

1. What are the processes of recording and storing of patient health records for referrals at hospitals in Limpopo?

2. How can an Electronic Health Record Framework be compiled to improve the patient referral process in these hospitals?

1.4 Purpose and Objectives of the study

The aim of this research is to investigate and understand the current process of patient record keeping and management, and the referral process of patients within the same hospital and to other hospitals and based on the findings compile an electronic health record framework to aid the e-Referral process.

The following objectives have been identified:

- To investigate and review the current patient record keeping process
- To investigate the current patient referral process
- To compile an EHR framework to aid e-referral processes in the hospitals

1.5 Literature Review

This section will represent the theoretical content that is necessary to understand the necessity of the research based on existing research and case studies. The review will focus on the following topics:

- Electronic Health Records
- Referral Processes

It is important to understand what Electronic Health Records mean to help understand this research in context. Below are two of the many definitions of EHR:

An electronic longitudinal collection of personal health information, usually based on the individual, entered or accepted by health care providers, which can be distributed over a number of sites or aggregated at a particular source. The information is organized primarily to support continuing, efficient and quality health care. The record is under the control of the consumer and is stored and transmitted securely (NEHRT, 2004)

The Electronic Health Record is a secure, real-time, point-of care, patient centric information resource for clinicians. The EHR aids clinicians' decision-making by providing access to patient health record information where and when they need it and by incorporating evidence-based decision support. The EHR automates and streamlines the clinician's workflow, closing loops in communication and response that result in delays or gaps in care. The EHR also supports the collection of data for uses other than direct clinical care, such as billing, quality management, outcomes reporting, resource planning, and public health disease surveillance and reporting (HIMSS, 2011). This definition will be used for the purpose of this study.

1.6 Research Methodology

This research study will use different approaches, methods and techniques for gathering information. Qualitative methods will be used. A case study approach will be employed and data will be collected using in-depth interviews, group discussions and documentation techniques. Collection of data will be supplemented by using a questionnaire.

1.6.1 Qualitative method

The research strategy employed in the study is the qualitative method. Qualitative research methods were developed in the social sciences to enable researchers to study social and cultural phenomenon (Denzin & Lincoln, 1994).

According to Denzin & Lincoln (1994), qualitative research focuses on interpretive and naturalistic approaches to its subject matter. This means that qualitative researchers study things in their natural settings attempting to make sense of or interpret phenomena in terms of the meaning people bring to them.

The strength of qualitative research lies in its ability to provide complex textual descriptions of how people experience a given research issue. It provides information about the human being side in terms of behaviour, beliefs, opinions and relationships between individuals. One of the greatest strengths of the qualitative research approach is the wealth and intensity of explorations and descriptions. Denzin & Lincoln (1994)

For this study, it is important to use qualitative research in order to understand the current process patient record keeping and referral process because it allows data to be gathered from multiple sources such as from people and documents. It is not limited to one source of information. Denzin & Lincoln (1994) states that Qualitative research methods are valuable in providing rich descriptions of complex phenomena, tracking unique or unexpected events, revealing the experience and interpretation of events by actors with widely differing stakes and roles. It also gives voice to those whose views are rarely heard.

1.6.2 Case Study method

A case study is an empirical enquiry that investigates a contemporary phenomenon within its real-life context. The case study approach is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used (Yin, 2009). Yin (2009) further indicates that multiple strategies can be used in any given study and in this case, documentation and interviews within a case study were used to collect data.

The case study method was employed in this study as the research design. The study was conducted using three Limpopo hospitals. A clear overview and investigation of how patient's record keeping and referral process is undertaken was studied.

1.6.3 Research Population

According to Babbie (2011), a study population is the entire aggregation of elements from which a sample is actually selected. The research population for this study is

comprised of three groups. These are the hospital administrators; CIO's and nurses from the three hospitals namely Shayandima Hospitals, Tshilidzini Hospital and Donald Fraser.

1.6.4 Data collection methods

Babbie (2011), states that there are several sources for data collection, but points out that the method of data collection must always be appropriate to the particular research project, and that the point of collection must be to gather evidence for the improvement of practice. For the purpose of this research data was collected using semi-structured interviews supported by documentation analysis and questionnaires

Source: Tero Mamia

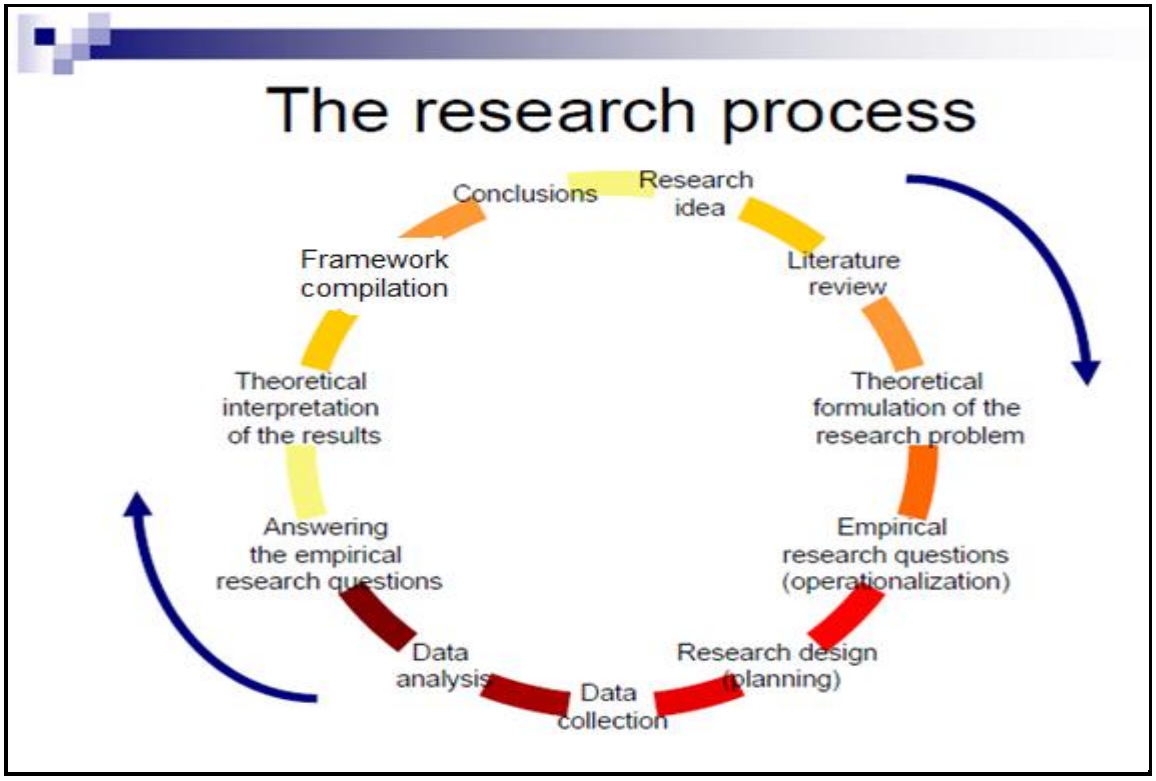

Figure 1.1: The Research Process

1.6.5 Ethical consideration

Welman and Kruger (2005) state that ethical considerations arise at three stages of a research project, namely: When participants are recruited; During the intervention or measurement procedure to which they are subjected; and In the release of the results.

Participation in this research will be voluntary and the participants can withdraw at any time. Oliver (2004) indicates that research which involves human participation should be reviewed by an ethics committee to determine whether the research should be allowed to continue or not. The research protocol will be reviewed and approved by UNISA.

1.7 Chapter Outline

Chapter 1: Introduction to the study

This chapter comprises the introduction and background of the study, research context, research problem statement and research objectives, underpinning theory and conclusion.

Chapter 2: Literature review

This chapter will include the literature review on electronic health record systems and electronic referral processes.

Chapter 3: Research methodology

This chapter will present the research methods and approaches employed in the study including the research strategy, design and data collection techniques.

Case study; research participants; data collection technique: data analysis methods

Chapter 4: Research findings and data analysis

This chapter presents the interpretation of findings and the framework

Chapter 5: Summary, reflection and conclusion

The last chapter provides a summary of the findings, the contribution of the research, the recommendations and a conclusion.

1.8 Conclusion

This research study provides background and insight into Electronic Health Records and e-Referral processes in Limpopo's public hospitals through investigation; using the relevant research methodologies and data analysis techniques. The results will be analysed and an EHR- Framework will be developed to assist referral processes in hospitals in Limpopo Province. The next chapter discusses the literature review.

CHAPTER 2: LITERATURE REVIEW

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter discusses the literature review of electronic health records and electronic referral processes as stated in the previous chapter. A literature review identifies and compares earlier studies, and helps to avoid duplication and unnecessary repetition (Mouton, 2003). Burns and Grove (2001) describe a literature review as "an analysis and synthesis of research sources to generate a picture of what is known about a particular situation and knowledge gaps that exist in that situation". The purpose of a literature review is to look for research approaches used by other researchers, which could be useful to a particular study (Manzini, 1998).

The literature review must answer the most critical questions that the figure below illustrates to ensure that the relevant information related to the study has been reviewed.

Source: Hart (1998)

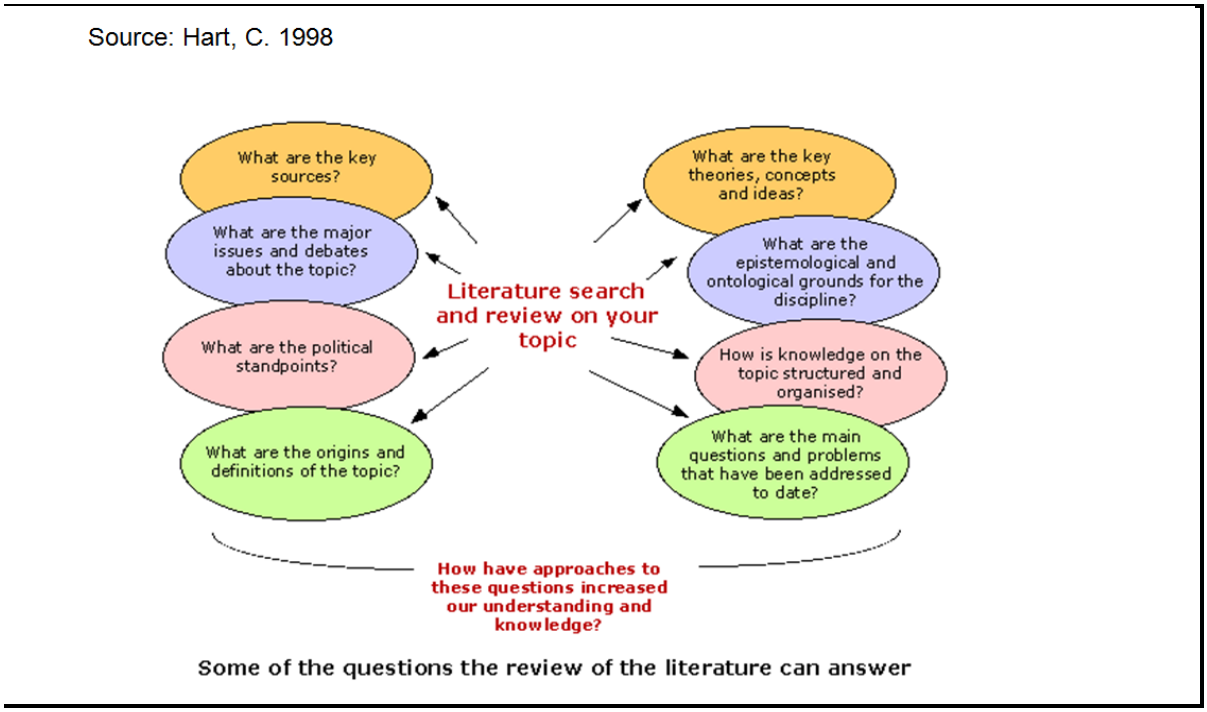

Figure 2.1: Literature Review Questions

According to previous studies done in South Africa and worldwide, it is clear that there is a vast need of electronic health records. Canada Health Infoway CHI (2009) recorded at least 23 countries where national electronic health record strategies were in place for the entire country and these strategies have been or are being implemented.

EHR Workshops have been conducted by an Intel expert with global experience, in Gauteng, Western Cape, Mpumalanga and Limpopo (DoH, 2008) to provide a strategic approach on the development of an electronic health record for South Africa. Different health information systems in provinces with different database systems and levels of sophistication and maturity in implementation already exist (DoH, 2008).

However in Limpopo, public hospitals have not yet fully implemented standardized EHS systems. In Limpopo none of the rural/public clinics or hospitals has a complete Electronic Record Systems (ERS) implemented. (Roy, 2008) The governments of many countries are working to ensure that all citizens have standardized electronic health records and that all records include the same types of information. The major barrier for the adoption of electronic health records is cost.

The first section of this chapter explores the literature review on Electronic Health Records and the categories below will be reviewed in this section.

- Definition of electronic health records
- Goals and objectives of electronic health records
- Components of electronic health records
- Patient record keeping and management
- Benefits of electronic health records
- Barriers and challenges of electronic health records
- Processes of electronic health records

- Usage of electronic health records
- EHR vs. Paper Health Records

2.2 Definition of electronic health record

An electronic health record can simply be described as patient health information that is stored electronically on computers. For the purpose of this research paper and to provide a broader understanding of EHR, we will look at various definitions of an Electronic Health Record.

According to World Health Organization (2006) An electronic health record (EHR) (also electronic patient record (EPR) or computerised patient record) is an evolving concept defined as a systematic collection of electronic health information about individual patients or populations. It is a record in digital format that is capable of being shared across different health care settings, by being embedded in network-connected enterprise-wide information systems. Such records may include a whole range of data in comprehensive or summary form, including demographics, medical history, medication and allergies, immunization status, laboratory test results, radiology images, and billing information

IOM (2003) gives a more thorough definition by defining an EHR system as including:

- A longitudinal collection of e-health information for and about persons, where health information is defined as information pertaining to the health of an individual or healthcare provided to an individual;
- Immediate electronic access to person-and population-level information by authorized, and only authorized, users
- Provision of knowledge and decision-support that enhance the quality, safety, and efficiency of patient healthcare
- Support of efficient processes for healthcare delivery

Electronic Health Record (EHR) is also defined as a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting (Sidorov, 2006). An electronic health record is the building block of a medical information system that substitutes the traditional paper medical record or chart. An electronic health record does not represent a single physical entity but is a functional view assembled when needed from data stored in various geographic locations, due to interoperability among EHR systems or use of intelligent agents to knit together data obtained from disparate sources into a single coherent record. The term encompasses a spectrum of systems: imaged-based, in which paper is converted to electronic displays; text-based, offering word-processing templates; and point-and-click navigation to structure data capture (Goldschmidt, 2005).

The Health Information Management Systems Society's (HIMSS,2011) definition of EHRs reads: The Electronic Health Record (EHR) is a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting. Included in this information are patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports. The EHR automates and streamlines the clinician's workflow. The EHR has the ability to generate a complete record of a clinical patient encounter, as well as supporting other care-related activities directly or indirectly via interface—including evidence-based decision support, quality management, and outcomes reporting. (HIMSS,2011).

An electronic health record is also defined as "an electronic record of health-related information on an individual that conforms to nationally recognized interoperability standards and that can be created, managed, and consulted by authorized clinicians and staff across more than one health care organization" (NAHIT, 2008).

The EHR is further defined as a collection of health information of multiple patient visits from a health care facility. The information contained in the record includes the patients' past medical history, demographics, medications, immunizations, laboratory reports and radiology reports. The EHR can create a full record of each patient encounter and other health care related activities via the EHR interface (MITRE, 2006).

2.3 Goals and objectives of electronic health records

South Africa joined the list of countries planning to implement Electronic Health Records and initiated the project to implement a National Electronic Health Record in May 2002 where a workshop was held in which three working groups were formed namely:

- Laboratory System Working Group
- Evaluation of the Health Information System and
- The Electronic Health Record Working Group (DoH National eHealth Strategy, South Africa, 2012)

The South African EHR initiative started in September 2003 in which a workshop was held, in order to standardise the EHR concept. However the EHR initiative was only published in 2007 (Department of Health(DoH), 2012). The workshop report has formed the basis of the National Strategic Framework for EHR in South Africa. During the workshop the Department of Health defined the goals of the EHS as:

- To integrate health record systems in the country by bringing together all the different health information systems facilitating access to health records within a province and across provinces
- To develop a population health care base
- To improve governance, planning administration and management of health systems at both national and provincial level.
- To improve the efficiency of health service delivery both personal care and public health services
- To enable national monitoring and evaluation of health trends
- To achieve comprehensive privacy and confidentiality requirements of the citizens

And the objectives as follows:

- Integrate different episodes into individual longitudinal records
- Track patients for continuing health care
- Reduce medical errors
- Provide easy access to records
- Improve referral systems
- Monitor health care behaviours
- Promote transparency and efficiency
- Improve surveillance methods

2.4 Components of electronic health records

Dr Tariq El-shheibia (2012)states the following as the key components of electronic health records in his research paper: A Future View towards Applying Electronic Health Record (EHR) System in Medical Institution in Libya.

- Administrative System Components
- Laboratory System Components
- Radiology System Components
- Pharmacy System Components
- Computerized Physician Order Entry
- Clinical Documentation

It is imperative to address the key components of electronic health record listed above in order to implement an effective and useful electronic health record system.

2.5 Patient record keeping and management

A health record may be defined as any relevant record made by a health care practitioner at the time of or subsequent to a consultation and / or examination or the application of health management (Klerk, 1998). A health record contains the information about the health of an identifiable individual recorded by a health care professional, either personally or at his direction. (Medical Protection Society (MPS), 2000)

Keeping good medical records is essential for continuity of care, especially when many health professionals are involved in a patient's care. Good record keeping is an integral part of good professional practice. Adequate medical records enable a person to reconstruct the essential parts of each patient contact without reference to memory. They should therefore be comprehensive enough to allow a colleague to carry on without supervision (Medical Protection Society (MPS), 2013)

The Medical Protection Society (2013) states that the quality of record keeping is characterized by the following:

Comprehensiveness

To be useful, the medical records should contain all the significant information that members of the health care team, or future carers, will need in order to be sufficiently informed about the patient's past and current clinical assessments and treatment and relevant family and social history, lifestyle and beliefs.

Contemporaneous

For the sake of good continuity of care, patients' records should be kept as up to date as possible, which means that information should be added to the patient's notes as soon as it becomes available. It is good practice to make a habit of noting information as it arises so that it is not lost if something happens to distract your attention, e.g. an emergency, a phone call, or an interruption by a colleague.

Comprehensible and accurate

When making notes in a patient's records, a balance must be struck between brevity and comprehensibility. Generally speaking, the briefer the note, the more open to misinterpretation it will be. On the other hand, no-one in a busy clinical setting has the time either to write or to read lengthy prose, so your notes should be as precise and concise as you can make them. Avoid generalizations and speculation. Stick to the facts and your objective findings. If you are reporting hearsay (e.g., a relative's account), use quotation marks and identify the source. Avoid using abbreviations that may not be understood in the context of multidisciplinary care.

It’s an obvious point to make, but errors in medical records can have a devastating effect on patients. Something as simple as a misplaced decimal point, hearsay presented as fact or test results filed in the wrong patient’s records can be fatally misleading. There are many reasons for inaccuracies in medical records all of which are commonplace occurrences such as being in a hurry, getting distracted, momentary inattention, or not fully understanding what someone is saying. Consequently, it is very easy for inaccuracies to creep into the records; common causes are: not listening attentively when taking a patient’s history; relying on memory after an interruption; hasty writing that’s illegible; or not checking the identity of the patient before filing reports or writing a note.

Attributable

If you write anything in a patient’s records, the Health Professions Council of South Africa (HPCSA) (2008) says that you must sign it and write your name in block capitals. You should also record the date and time and, in the case of hospital records, your bleep or telephone number.

The following can be regarded as the essential components of a health record, obviously depending on the nature of the individual case:

- Hand-written contemporaneous notes taken by the health care practitioner
- Notes taken by previous practitioners attending health care or other health care practitioners, including a typed patient discharge summary or summaries
- Referral letters to and from other health care practitioners
- Laboratory reports and other laboratory evidence such as histology sections, cytology slides and printouts from automated analyzers, X-ray films and reports, ECG races, etc
- Audiovisual records such as photographs, videos and tape-recordings
- Clinical research forms and clinical trial data
- Other forms completed during the health interaction such as insurance forms, disability assessments and documentation of injury on duty
- Death certificates and autopsy reports(HPCSA, 2008)

While record keeping, at least the following information for each patient should be maintained:

- Personal (identifying) particulars of the patient.
- The bio-psychosocial history of the patient, including allergies and idiosyncrasies.
- The time, date and place of every consultation.
- The assessment of the patient's condition.
- The proposed clinical management of the patient.
- The medication and dosage prescribed.
- Details of referrals to specialists, if any.
- The patient's reaction to treatment or medication, including adverse effects.
- Test results.
- Imaging investigation results.
- Information on the times that the patient was booked off from work and the relevant reasons.
- Written proof of informed consent, where applicable(HPCSA, 2008).

2.6 Benefits of electronic health records

Previous literature reviews support the use and implementation of electronic health records. The healthcare industry learned from other industries about the benefits of computerization and electronic health records (Farsi & West, 2006). By the 1980s, the healthcare industry established a dependency on information technology for maintaining personal records, scheduling, billing and accounting, materials management, and the management of clinical and business operations. Benefits of computerization include the speed of communication, accuracy of information, capability of information storage, and data retrieval (Farsi & West, 2006).

The EHR is viewed as an essential technology, which can improve delivery and quality of healthcare, provide significant cost savings, and make patient information available around the clock and world. In his January 20, 2004, State of the Union address, the President of the United States George W. Bush, said, "By

computerizing health records, we can avoid dangerous medical mistakes, reduce costs, and improve care" (New Generation of American Innovation, 2004).

The benefits of EHRs as indicated by Roy (2008) include the following:

- The ability to automatically share and update information among different offices and organizations.
- More efficient storage and retrieval.
- The ability to share multimedia information, such as medical imaging results, among locations.
- The ability to link records to sources of relevant and current research.
- Easier standardization of services and patient care.
- Provision of decision support systems (DSS) for healthcare professionals.
- Less redundancy of effort.
- Lower cost to the medical system once implementation is complete.

Other benefits most cited as described by Cherry, Ford and Peterson et al.,(2009) include:

- Interoperability
- Integration among clinical systems
- Standardized language
- Decision support
- Physician usage of EHRs.

2.7 Barriers and challenges of electronic health records

The following quotation from the NSDA(2014) sums up the challenges for e-Health in which EHR is a big part of: *"*Although large sums of money have been used to procure health ICT and HIS in South Africa in the past, the ICT and HIS within the Health System is not meeting the requirements to support the business processes of the health system thus rendering the healthcare system incapable of adequately

producing data and information for management and for monitoring and evaluating the performance of the national health system. This results from the lack of technology regulations and a lack of policy frameworks for all aspects of infrastructure delivery."

The quotation highlights key challenges identified in relation to e-Health as a whole. The following are specific challenges identified with respect to e-Health, particularly in the public sector:

- No national e-Health strategy and corresponding Enterprise Architecture supporting the national health system.
- Limited capacity or capabilities within the public sector to implement a national e-Health strategy. Widely differing levels of e-Health maturity across and within provinces.
- A large number of disparate systems between which there is little or no interoperability and communication.
- Silos of information within levels of government, government departments and programmes within the national and provincial departments of health, resulting in duplication of effort and disparities in reporting.
- Inequity of e-Health services provided and expenditure on e-Health across national and provincial departments of health. (This may be related to differing strategic importance placed on Health).
- Broadband connectivity is expensive and still out of reach of many.
- A low degree of cooperation, collaboration and sharing across all sectors.
- Several past initiatives have not reached fruition because of poor planning or lack of consistent sponsorship, management and/or funding.
- Need for strong information governance to ensure compliance with the necessary standards and procedures for, and appropriate use of, health information (both patient-based and aggregate).
- Different organisational structures for e-Health service provision exist in provinces, e.g. health ICT services may reside within a department of health but in an inappropriate section, or within another department.
- The absence of a national master patient index and lack of consensus on unique identification of patients.

- A lack of cooperation between various groups resulting from lack of a clear understanding that e-Health includes all ICTs for health such as mobile technologies, telemedicine and electronic patient records.

This lack of cooperation prevents urgently needed progress in using e-Health as an enabler (DoH National eHealth Strategy, South Africa (2012)

2.8 Processes of electronic health records

An e-patient health record is central to the operation of the other e-health solutions. The types of data that can be stored in such a record include:

- Basic biographical data which gives patient identity and contact information
- Core medical information like allergies, current problems, conditions and medication
- Cumulative medical history.

These data are generated by the various departments of a hospital and later stored in the central database server in each hospital. The data are further replicated and transferred to the selected host hospital servers.

2.9 Usage of electronic health records

According to the study by DesRoches et al., (2008) and her colleagues, in South Korean hospitals, 4% of physicians were using a fully functional EHR system of which 97% of respondents reported that they were using all the functions in the system at least some of the time. Thirteen percent of physicians were using a basic EHR system and more than 99% of those physicians reported that they were using all the functions at least some of the time. (DesRoches et al., 2008)

In South Africa, different information systems are used in the public sector. For the purpose of this research, Limpopo was the target group for this project where Medicom is used across the province for partial record keeping. Many of the patient

records are still paper based but the NHI project has been approved and will be completed over a 14 year period (DOHSA, 2011)

2.10 EHR vs. Paper Health Records

Essential differences between paper health records and EHR, regarding location, readability, accessibility, traceability, supported healthcare processes and data self-sorting have been identified (Bakker, 2007; Veselý, Zvarova, Peleška, Buchtela and Anger, 2006; Bates, Cullen and Laird, 2003; Kuperman et al. ,2001; Warshawsky et al., 1994; Allan and Englebright, 2000).These are summarized in Table 2.1

	Paper Health Records	**EHR**
Location (Bakker, 2007)	Generally viewed only at one location (where the physical document is present)	Can be viewed from multiple locations
Readability (Bakker, 2007)	Easily and directly read	Software needed to transform the digital data into a readable presentation
Accessibility (Bakker, 2007)	Access to data is all or none	Different levels of authorization are granted to access digital data
Traceability (Bakker, 2007)	Impossible to record who has seen the data and when	Keep a trail of the use
Supported care process (Veselý et al, 2006; Bates et al., 2003; Kuperman et al., 2001)	No	Physician order entry, appointments, prescription and dose guidelines and so forth
Data self-sorting (Warshawsky et al, 1994; Allan, 2000)	No	Yes

Table 2.1: Differences between paper health records and EHR

The second section of this chapter explores the literature review on Electronic Health Referrals and the categories below will be reviewed in this section

- Definition of e-Referrals
- Components of e-Referral
- E-Referral processes and process flows
- Benefits of e-Referral
- Usage of e-Referral

2.11 Definition of e-Referrals

To refer is “to direct somebody to somebody or somebody else for information, help, treatment or judgment e-referrals means the transmission of an electronic document, such as a text document or PDF which can be received and viewed by the referee on their computer. The e-referral message is generated from the referrer’s computer, ideally by the referral being auto-populated with information directly from the referrer’s records about the patient. The message is then securely transmitted to the referee (DHS, 2006). Figure 2.2 below shows the processes that are involved in e-referral.

Source: DHS (2006).

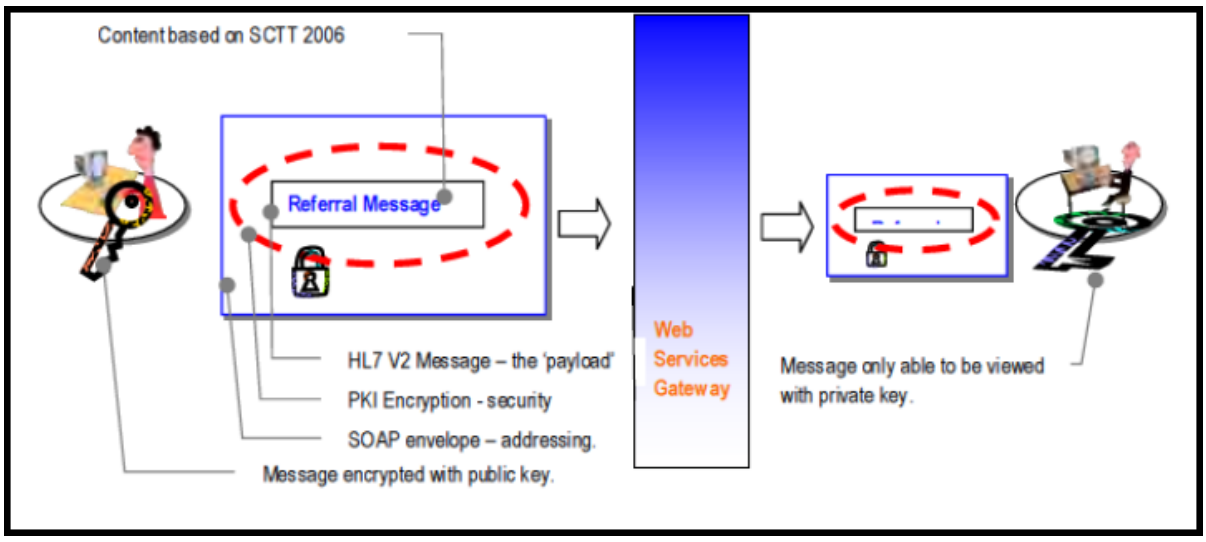

Figure 2.2: e-Referral process

For the purpose of this research study, e-Referral is the transmission of electronic documents from doctor-to-doctor, doctor-to-other health professionals within the same hospital and outside hospitals.

e-Referrals or electronic referrals is an electronic platform that enables the seamless transfer of patient information from a primary to a secondary treating practitioner's client management system (National E-Health Transition Authority (NEHTA)). E-Referrals have fast become the best replacement for paper-based referrals, and hold great potential toward the ultimate goal of seamless communication and information sharing between practitioners.

HealthSMART(2008) defined it as: electronic application to application (A to A) interoperability using data transmission to support the consented and secure exchange of information between organizations in the health and human services sector, for the referral process:

Examples are;(HealthSMART, 2008)

- Referring a patient/client from a community health agency to a service provided by a service provider at another agency; community or acute
- Referring a patient/client from a general practitioner to a service provided by a service provider at an outpatient department, or
- Referring a patient/client from a general practitioner to a service provided by a service provider at a community health agency non-electronic data exchange: (Post or Phone)
- Machine transportable data limited to non-electronic manipulation: (fax or scanned documents)
- Machine organized data that require manual translation (Email, eg: Via Argus, InfoExchange, etc)
- Machine interpretable data transmission utilizing structured messages from standardized and coded vocabularies (HL7 or other messaging standards, EDI)

2.12 Components of e-Referral process

The referral process encompasses many components as shown in the definition by Anderson and Helms (1991) “Referrals communicate information about patients’ continuing care needs between health organizations as they transfer responsibility for providing different levels of care. According to the American Hospital Association (AHA) the purpose of a referral is to ensure that appropriate and timely information about patients’ medical conditions care needs and social situations are communicated to the next organization providing care. Thus the goal/outcome of referrals is the uninterrupted coordinated delivery of quality health care by the next service providers”. (Anderson and Helms, 1991)

The terms communication, coordination and information are mostly used in the referral process. In figure 2.3 below Anderson(1991) describes the referral process as a classic communication model.

Source: Anderson(1991)

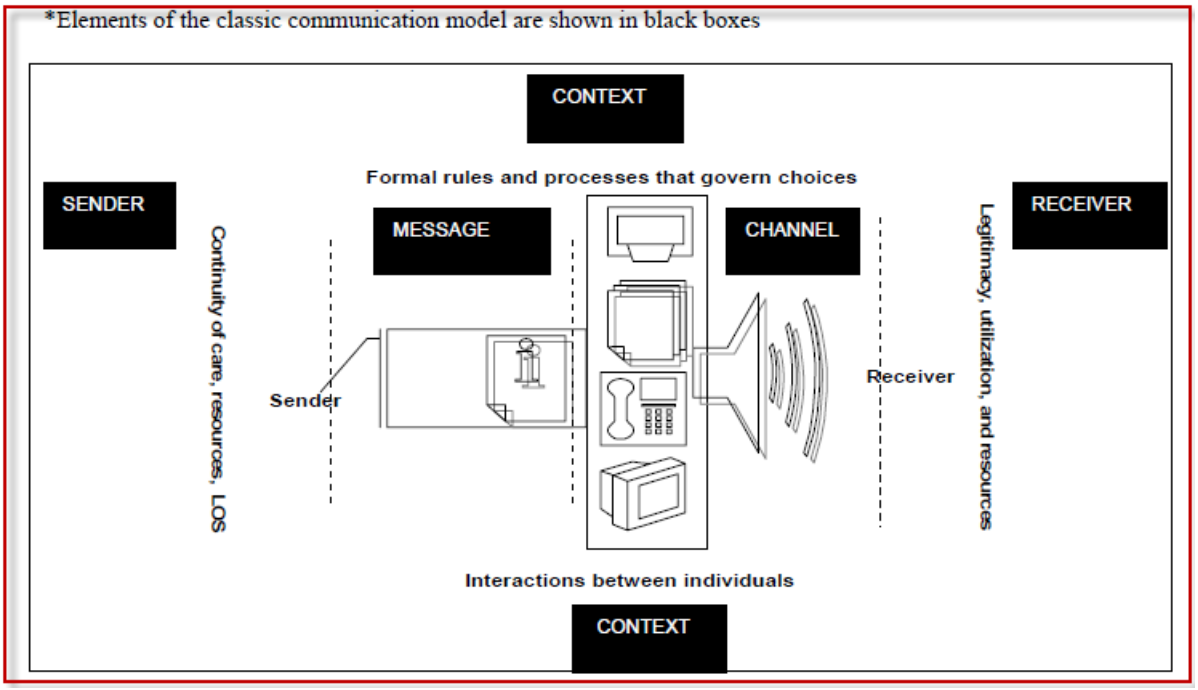

Figure 2.3: The referral process described in terms of the classic communication model

In this classic communication model, the components include a sender; a receiver; a message which can contain different types or amounts of information; a communication channel; and some sort of feedback loop (Anderson, 1991). A message is sent through a communication channel to a receiver who decodes it.

2.13 e-Referral processes and process flows

A common process of patient referral would involve a consultation by a patient to a general practitioner (GP) for a health problem. The practitioner examines him and some of his reports in relation with his health problem. After the visit the practitioner prescribes an exam. A number of tasks are involved during the e-Referral process. These tasks are composed in three steps mentioned below and also shown in figure 2.4

- Referral Requested
- Referral Scheduled
- Referral Referred(IHE 2012)

Source: IHE (2012)

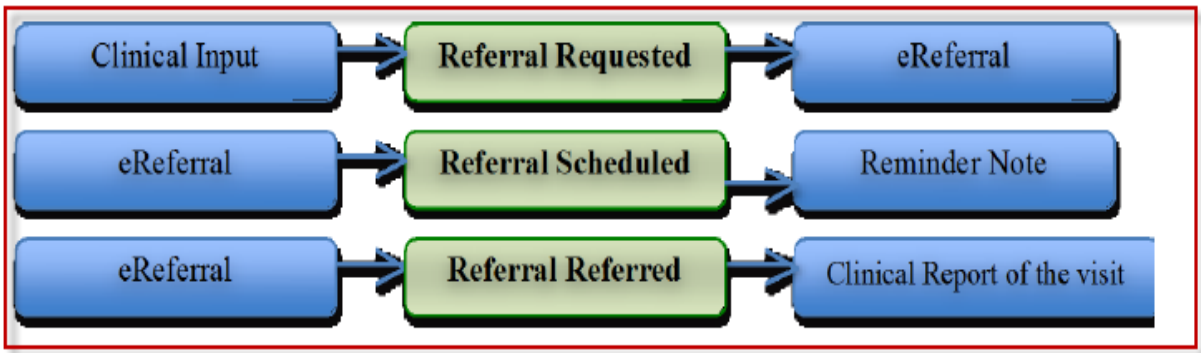

Figure 2.4: Tasks involved in the e-Referral process

The tasks are also presented in a process flow format to give a step by step flow of the tasks in figure 2.5 below.

Source: IHE (2012)

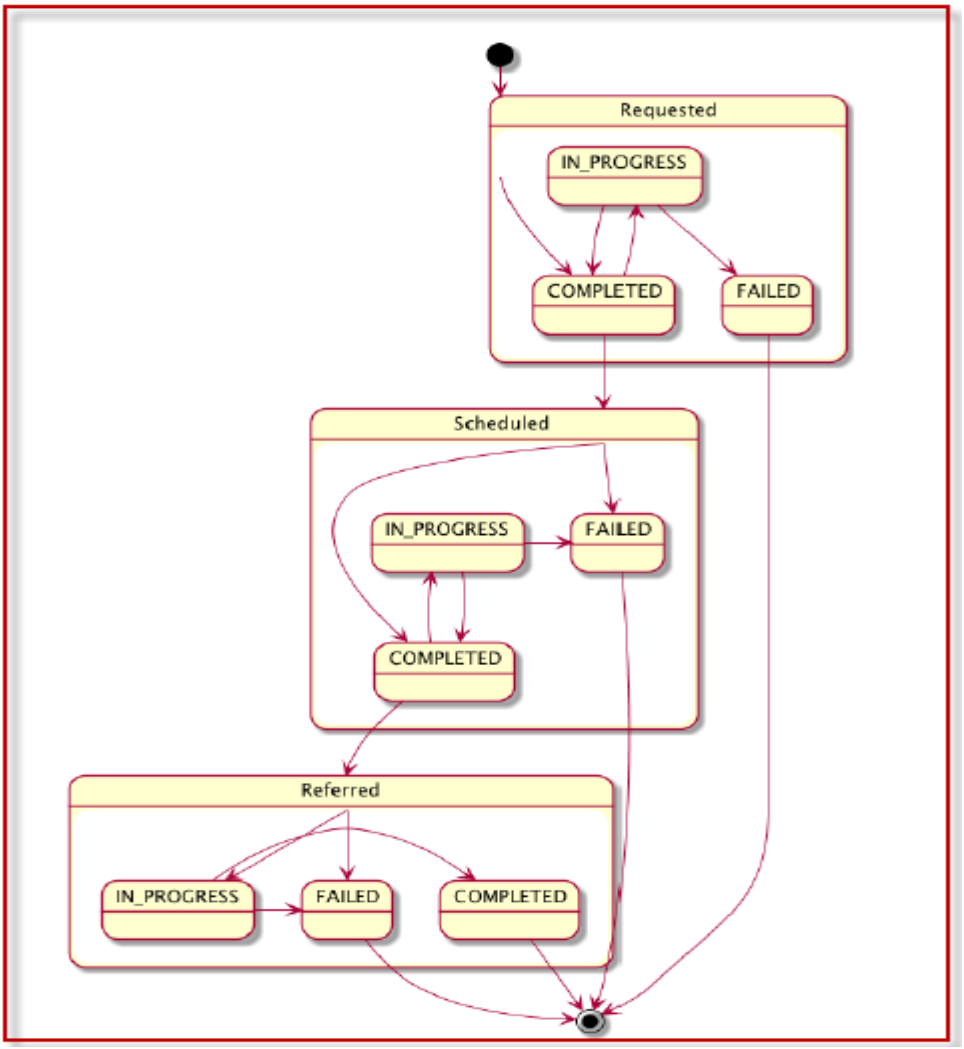

Figure 2.5: e-Referral complete process flow

In the section below, figure 2.6 presents the participants involved in the e-Referral process and describes in detail process transactions and interactions between them. A Participant is an abstraction of a system along with users involved in the e-Referral process. They can be identified, based on their roles in the process, as one of four specific participants. Each of these workflow participants has specific rights and duties in the process. They drive the process from one step to another, performing determinate actions on the workflow (IHE,2012).

Source: IHE (2012)

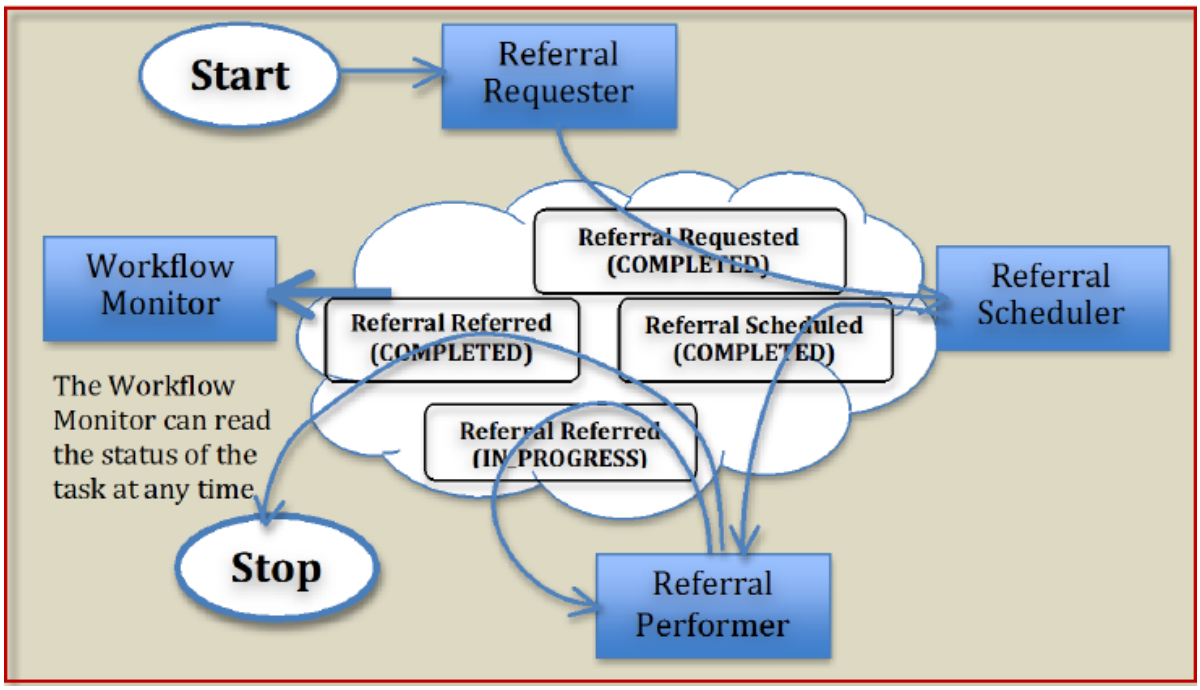

Figure 2.6: Process transactions between participants

2.14 Benefits of e-Referrals

e-Referral supports a more efficient and comprehensive system by enabling service providers to share and update client service histories, with client consent, to better meet client needs and agency processes. The system increases service provider effectiveness by eliminating the burden of re-capturing basic data, and delivering up-to-date and accurate client service histories. E-Referral supports streamlining the making of client appointments, and goes hand in hand with service provider access to the electronic State-Wide Services Directory and other local online directories. E-Referral makes life easier for the client because their service histories stay within the system, eliminating the burden of repeating their stories, and releasing more time for receipt of actual services.(DHS, 2004).

Signposting, Referral and Referral Networks Discussion Document (2010) list the following as the benefits of e-Referral:

- Easy to keep up to date and allow for timely responses
- Facilitate the production of statistics indicating the number of clients referred to other oganisations and of clients received from other agencies to inform funding applications
- Help reduce manual work, wasted telephone calls and duplication of work
- Complement and enhance existing referral networks
- Improve partnership working amongst advisers and the advice community
- Enhance cement and improve the efficiency of the referrals.

2.15 Usage of e-Referrals

Health innovation by e-Referral has been acknowledged worldwide as a promising way to optimise patient flow and to facilitate patients' care between primary and secondary healthcare Heimly (2009). Many were hopeful that this would enhance overall health outcomes and be of significant economic benefit. The table below depicts some of the countries that are using e-referrals.

Source: Heimly (2009)

Country adopting e-referral system	Start date(Approx)	Number of GP's	No of e-referrals per year
Finland (Helsinki)	1990	200	67,000 (by2002)
Finland (Oulu)	1991	10	2,000 (by 2002)
Denmark (Medcom-EDI)	1995	2024	41% (by 2004)
Denmark	1995	2024	63% (by Nov 2008)
Norway (ELIN)	1996	N/A	25% (by Jan 2009)
Netherlands (ZorgDomai)	2001	100	5000 (by Dec 2004)
Netherlands	2001	2000 (by 2008)	N/A
Australia	June 2009	30	N/A
New Zealand (Hutt Valley)	2007	34	90% (by Jan 2009)

Table 2.2: Summary of countries adopting e-Referrals

Most of the countries that have implemented e-Referrals have emerged from the context of wealth where there are well developed national and local ICT infrastructures through which health and other public and private services are supported. These countries have followed the technology acceptance model (TAM) to analyse readiness of these countries to have implemented e-Referrals. Davis (1989) stresses that any information technology acceptance model should consist of two prominent models, namely, a Technology Acceptance Model (TAM) and a Motivational Model. This is illustrated in figure 2.7 below

Source: Wilson and Lankton (2004)

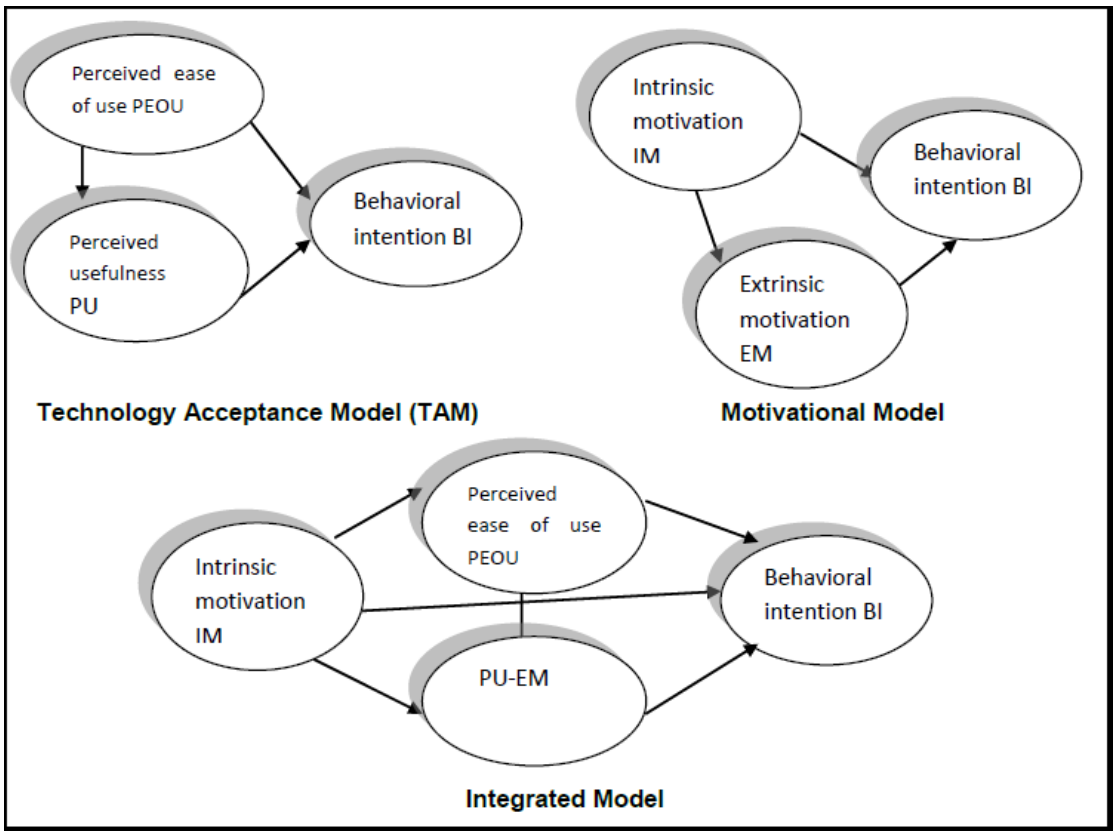

Figure 2.7: Three models of technology acceptance

According to Lanseng and Andreassen (2007), the TAM Model suggests that when users are presented with a new technology, two notable factors influence their attitude towards using the application. These are its perceived usefulness and perceived ease of use. Davis (1989) explains that perceived usefulness refers to the degree to which a person believes that using a particular system can enhance his

job performance, while perceived ease of use refers to the degree to which a person believes that using a particular system may free him or her from effort. These two, according to Davis (1989), are key contributors to behavioural intention (BI) to the use of that technology.

2.16 Conclusion

This chapter discussed the literature review on the electronic health record system and electronic referral process, whereby explanations are provided in detail by discussing the definitions, goals, objectives, processes and process flows, benefits, components, usage, barriers and challenges, record keeping and management. The next chapter discusses the research methodology.

CHAPTER 3: RESEARCH METHODOLOGY

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes in detail the research methods and approaches employed in the study for achieving the objectives of the study. It also explores the research methodology which includes a case study, research participants, data collection technique and data analysis methods.

The chapter is divided into four sections. The first and second sections discuss the research design and research approach, respectively. The third and fourth sections cover the data collection and analysis of the data, respectively. An overview of the research design model from Saunders, Lewis and Thornhill (2012) in this study is depicted in Figure 3.1 where a research onion is illustrated.

Source: Saunders, Lewis and Thornhill (2012)

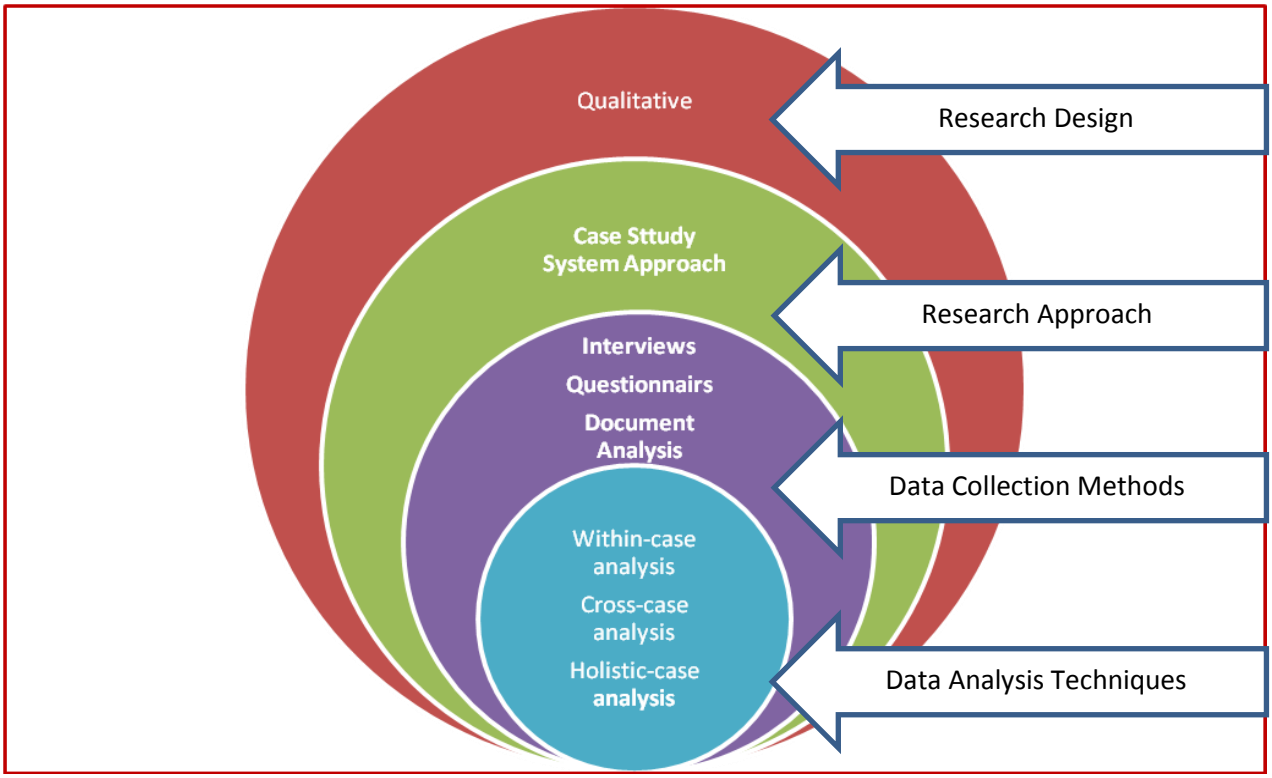

Figure 3.1: Research process onion

The research onion presented above compares the research processes to peeling the different layers of an onion until the centre has been reached (Saunders, 2012). According to Saunders (2012), the centre of the research process is the analysis of the collected data. The layers are peeled off in order of precedence, the first layer to be peeled off is the research design followed by the research approach, data collection methods and data analysis technique. The next section discusses the different layers of the onion.

3.2 Research Design

Pilot and Hungler (1999), describes research design as a blueprint, or outline, for conducting the study in such a way that maximum control will be exercised over factors that could interfere with the validity of the research results. Research design is the plan and structure of investigation to obtain answers to research questions (Cooper & Schindler, 2013). This supports the decision made in selection of the design. The aim was to find answers to the research questions set in this study. Research design is the plan of what data to gather, from whom, how and when to collect the data, and how to analyse the data obtained. According to Yin (2009), research design is a set of advanced decisions that make up the master plan specifying the methods and procedures for collecting and analysing the necessary information.

For the purpose of this study a qualitative research design supported by a case study approach has been used. The next section will discuss qualitative research and the case study approach.

3.2.1 Qualitative research

Qualitative research is the non-numerical assessment of observations made through participant observations, content analysis and other qualitative research techniques (Babbie, 2011). Qualitative research relies less on numbers and statistics and more on interviews, observations, small numbers of questionnaires, focus groups, subjective reports and case studies (Easton, 2002). The qualitative method is

defined as a method that provides detailed and in-depth information (Cooper & Schindler, 2013).

Qualitative data interpretation tends to be more subjective in nature and many times can be influenced by the researcher's biases (Leedy and Ormrod, 2001). Effort must be put into the data collection process to eliminate bias including collecting more than one kind of data, get many different kinds of perspectives on the events being studied, purposely look for contradicting information, and acknowledging your biases that relate to your research report (Leedy and Ormrod, 2001).

Qualitative data analysis is time consuming and complex because a lot of data can be created that is both useful and not useful (Leedy and Ormrod, 2001). There is no "correct way" to analyze qualitative data (Leedy and Ormrod, 2001). Efforts can be made to make your data presentation and interpretation more credible and less biased by using the above methods.

The research strategy employed in this study is the qualitative method because it allows data to be gathered from multiple sources such as from people and documents. It is not limited to one source of information. Qualitative research methods are valuable in providing rich descriptions of complex phenomena, tracking unique or unexpected events, revealing the experience and interpretation of events by actors with widely differing stakes and roles. It also gives voice to those whose views are rarely heard. Thus, the qualitative method was followed in the data collection, using the interview and questionnaire approach to investigate the electronic health records and electronic referrals.

Table 3.1 below has provided direction on making a decision as to which research design to use. It looks at the comparison between qualitative and quantitative approaches. The table uses five areas for the comparison being general framework, analytical objectives, question format, data format and flexibility in study design.

Source: Mack et al.,(2005)

	Quantitative	Qualitative
General Framework	Seek to confirm hypotheses about phenomena. Instruments use more rigid style of eliciting and categorizing responses to questions. Use highly structured methods such as questionnaires, surveys, and structured observation.	Seek to explore phenomena. Instruments use more flexible, iterative style of eliciting and categorizing responses to questions. Use semi-structured methods such as in-depth interviews, focus groups, and participant observation.
Analytical Objectives	To quantify variation. To predict causal relationships. To describe characteristics of a population.	To describe variation. To describe and explain relationships. To describe individual experiences. To describe group norms.
Question format	Closed-ended.	Open-ended.
Data format	Numerical (obtained by assigning numerical values to responses).	Textual (obtained from audiotapes, videotapes, and field notes).
Flexibility in study design	Study design is stable from beginning to end. Participant responses do not influence or determine how and which questions researchers ask next. Study design is subject to statistical assumptions and conditions.	Some aspects of the study are flexible (for example, the addition, exclusion, or wording of particular interview questions). Participant responses affect how and which questions researchers ask next. Study design is iterative, that is, data collection and research questions are adjusted according to what is learned.

Table 3.1: Comparison of quantitative and qualitative research approaches

3.3 Research approach

A case study research approach has been used for the purpose of this study and it is supported by the systems approach with the aim to answer the research questions. The approaches are discussed in detail below.

3.3.1 Case study approach

A case study can be defined as a type of qualitative research in which in-dept data are gathered relative to a single individual, program or event, for the purpose of learning more about an unknown or poorly understood situation. (Leedy and Ormrod, 2005). Lester (1997) defines case studies as a formal report based on the examination of a prearranged subject. A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used (Yin, 2009). According to Yin's definition, the multiple approaches distinguish a case study from other non-experimental methods. Case study research is an ideal methodology when a holistic, in depth investigation is required. It is designed to bring out the details from the viewpoint of the participant by using multiple sources of data (Feagin, Orum & Sjoberg, 1999).

According to Yin (2009), a case study can be used in an exploratory study. This study is an exploratory study that investigates real-life current EHR and e-Referral processes. Exploratory in this case means investigative and analytical. It involves informal discussions with employees and in-depth interviews with the management of the hospitals. Figure 3.2 below shows the sources of evidence that a case study can use for investigation in the study.

Source: Yin (2009)

Figure 3.2: Source of evidence

As noted above, the case study method allows investigators to retain the exploratory method as an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. This study requires an in-depth search and delving into some specific projects for detailed information needed for better understanding and description of the effects. The investigation includes interviews, questionnaires, and project document analysis.

Critics of the case study method believe that the study of a small number of cases can offer no grounds for establishing reliability or generality of findings. Others feel that the intense exposure to study of the cases biases the findings. Some dismiss case study research as useful only as an exploratory tool. Yet researchers continue to use the case study research method with success in careful planned and crafted studies of real-life situations, issues, and problems. (Soy, 2006).

The study was conducted using three public hospitals in Limpopo Province. The hospitals are Elim Hospital, Tshilidzini Hospital and Donald Fraser Hospital. The three hospitals were selected because they are all within the same district and will provide the researcher with a clear overview and understanding of the EHR processes and e-Referral processes. A research design for case studies defines a study question, its proposition, unit of analysis and requirements for interpreting the findings. Therefore a case study was used to meet this statement in this research.

3.3.2 Advantages of case study approach

According to Yin (2009) the following are advantages of a case study:

- Provides users with the opportunity to tackle complex problems that can't be simulated in the classroom
- Can be reused or applied in different situations
- Provides a condensation of multiple issues expressed through the one problem.

3.4 Data collection methods

Pilot and Hungler (1999) define data as “information obtained during the course of an investigation or a study”. In this study, interviews, questionnaires and documentation analysis were used to collect data relevant to the study.

3.4.1 Interviews

Interview involves oral questioning of responding either individually or as a group (Denscombe, 2003). The interviews were conducted in a form of group interviews and were guided by open-ended questions. The group interviews were conducted in arranged boardrooms in the different hospitals. Hospital Administrators, Nurses and CIO’s participated in group interviews. According to Feagin et al (1999) three types of interview methods namely structured, semi-structured and unstructured interviews were stated in his study and below are the explanations.

According to Bernard (1998), a semi-structured interview provides greater scope for discussion and learning about the problem, opinions and views of the respondents. Semi-structured interviews are best used when the researcher is not likely to get more than one chance to interview an individual. Greeff (2002) emphasises that semi-structured interviews are especially suitable where the issue is controversial and personal. The objective is to understand the respondent's viewpoint rather than to make generalisations about behaviour. Hockey & Robinson (2005) stated that semi-structured interviews are often followed by observation and informal, unstructured interviewing to allow the researcher to develop an intense understanding of the topic or subject of interest. This study employed the semi-structured interview technique in the data collection. Such interviews allow interaction between the interviewer and the individual participants and start with a specific question. This allows individual participants to think and question the interviewer (Cooper & Schindler, 2013). The convergent interviewing approach was applied to allow the researcher to refine the research questions during the interviews to converge issues that arose during the interviewing process. The question which was prepared for the interview was aimed at determining the acceptance and expected outcome if EHR was implemented at the hospitals.

3.4.2 Questionnaires

A questionnaire is “a formal, written document in which respondents complete the instrument themselves in a paper-and-pencil format” (Polit & Hungler 1999). The researcher collected data from the respondents by means of self-administered structured questionnaires. Each respondent was asked the same questions in a predetermined order. The researcher assured the respondents that their responses would be treated strictly confidential and obtained informed consent from them before distributing the questionnaires. Self-administered questionnaires were relevant for this study because they ensure a higher response rate (Mouton, 2003). Moreover, questionnaires save time for both researcher and respondents. The researcher was available to answer and clarify any queries. Table 3.2 shows the number of personnel provided with questionnaires in the hospitals respectively.

	Elim Hospital	**Donald Fraser Hospital**	**Tshilidzini Hospital**
Nurse	2	2	2
Administrators	2	2	2
Chief information officer (CIO)	1	1	1

Table 3.2 Questionnaire Distribution

3.4.3 Document analysis

Documentation was used as another resource of data collection. The hospitals granted the researcher access to view documents as an example to show the kinds of records that are kept and the referral process followed based on the assurance that the information would be treated confidentially and would be used for academic purposes only. The records management and referral documentation was collected for in-depth analysis and to confirm the evidence collected in the interviews and questionnaires.

3.5 Research Population and Sampling

Polit and Hungler (1999) refer to the population as an aggregate or totality of all the objects, subjects or members that conform to a set of specifications. In this study the population included hospital professionals such as Administrators, Nurses and CIO's (Chief Information Officers). The individuals were selected because of their eligibility criteria. Eligibility criteria specify the characteristics that people in the population must possess in order to be included in the study (Polit & Hungler 1999). The eligibility criteria in this study were that the participants had to

- Be health professionals
- Employed for more than two years
- Work with patient health records
- Work with patient referrals

According to Holloway and Wheeler (2002), sampling strategies of qualitative research are guided by the principle of gaining in-depth information. In this research study, a purposive sampling technique was used to select the participants from the population. Babbie (2011) refers to purposive sampling as where the researcher selects the units or elements which are most useful or representative to the research. Therefore five participants as indicated in table 3.3 were selected in each hospital. The participants were selected because of their positions which were relevant to answer the research questions. The same participants were interviewed and given questionnaires.

	Elim Hospital	**Donald Fraser Hospital**	**Tshilidzini Hospital**	**Total**
Nurse	2	2	2	6
Administrators	2	2	2	6
Chief information officer (CIO)	1	1	1	3
Total	5	5	5	15

Table 3.3: Summary of Participants (n=15)

3.6 Data analysis techniques

Data analysis begins when data collection begins. Data analysis is conducted to reduce, organise and give meaning to the data. The analysis techniques implemented are determined primarily by the research objectives, questions or hypotheses (Burns & Grove, 2001). Data analysis is the process of bringing order, structure and meaning to collected data (Marshall & Rossman, 2006). According to Brink (1996) the purpose of data analysis is to break down the data to make it possible to interpret the information . Data analysis entails categorising, ordering and describing data in meaningful terms.

Furthermore Yin (2009) notes that one important practice during the data analysis phase of any case study is the return to the propositions; there are several reasons for this.

- Firstly, this practice leads to a focused analysis when the temptation is to analyze data that are outside the scope of the research questions.
- Secondly, exploring rival propositions is an attempt to provide an alternate explanation of a phenomenon.
- Thirdly, by engaging in this iterative process the confidence in the findings is increased as the number of propositions and rival propositions are addressed and accepted or rejected.

In this study the data that were collected from questionnaires, interviews and documentation will be analysed by categorizing the data into themes and finding common patterns for interpretation. In this study the researcher has employed Creswell's (2009) template for case study analysis namely: within-case, cross-case and holistic-case analyses. Creswell (2009) explains these three methods as follows:

- Within-case analysis: This type of analysis may apply to either a single case or multiple collective case studies. In within-case analysis the researcher analyzes each case for themes. In the study of multiple cases, the researcher may compare the within-case themes across multiple cases in cross-case analysis.

- Cross-case analysis: This form of analysis applies to a collective case in which the researcher examines more than one case. It involves examining themes across cases to discern themes that are common to all cases.

- Holistic-case analysis: In this approach to data analysis, the researcher examines the entire case and presents descriptions, themes and interpretations or assertions related to the whole case.

In this study, all the three methods of data analysis are used because the researcher has set out to investigate each hospital's patient record storing procedures, patient referrals and ICT availability and usability and therefore conclude a summary of these findings.

3.7 Measures to ensure trustworthiness

Oates (2008) indicates that trustworthiness is about how much trust can be placed in a research output. According to Holloway and Wheeler (2002), a study is authentic when the strategies used are appropriate for the true reporting of the ideas of the participants, when the study is fair; and when it helps participants and similar groups to understand their world and to improve it. Authenticity was achieved by the researcher's fairness to all the participants and gaining their acceptance throughout the study . Furthermore, continued informed consent was obtained in this research. Holloway and Wheeler (2002) point out that trustworthiness in qualitative research means methodological soundness and adequacy. The researcher made judgments of trustworthiness possible through developing the following:

- **Credibility**

Credibility corresponds to the notion of internal validity (Oates 2008). This means that the participants are able to recognize the meaning that they give to a situation and the truth of the findings in their own social context. The researcher ensures that the findings are compatible with the perceptions of the participants (Holloway and

Wheeler, 2002). Credibility was ensured by doing prolonged and varied field work, the interviewing process, peer review, reflexivity and triangulation. The researcher ensured prolonged and varied field experience by spending time in establishing rapport with the participants before commencing the interview so that the participants could become accustomed to the researcher. The researcher stayed for a while after the interviews because the participants continued talking after the conclusion of the interviews. This is important because as the rapport increased, participants volunteered new information. Credibility was also enhanced in the interviewing process as the researcher reframed questions, repeated or expanded questions on different occasions during the course of the interview process.

Triangulation is a powerful strategy for enhancing the quality of research (Krefting, 1991). Triangulation of data gathering methods and sources is used to ensure trustworthiness. Data were obtained from three different groups of participants, namely, hospital administrators, nurses and Chief Information Officers in order to cross-check data and interpretation. The data obtained was analyzed twice by both the independent coder and the researcher.

- **Relevance**

Relevance is defined as “being pertinent, having direct bearing” (Oates 2008). The knowledge acquired in this study is relevant to other situations, and those who will carry out the research in another context will be able to apply the concepts originally developed in this research (Holloway and Wheeler, 2002) . A dense description of the background information is provided about the participants and the research context and setting to allow others to assess how the findings can be used.

- **Dependability**

Oates (2008) refers to dependability as how well the research process is recorded and the data documented. If the findings of a study are to be dependable, they should be consistent and accurate. In this study the strategies used to ensure trustworthiness include detailed description, triangulation and peer review. An independent coder was utilized to increase dependability.

- **Confirmability**

Oates (2008) further states that confirmability answers the question: Have the audience been told enough about the study to judge whether the findings do flow from the data and the experiences in the setting? This means that the research must be able to show how the researcher arrives at the constructs, themes and their interpretations. Thus, Holloway and Wheeler (2002) maintain that the details of the research, the background and the feelings of the researcher need to be made open for public scrutiny. Triangulation of methods and sources and reflexivity are used to ensure trustworthiness in this research.

3.8 Ethical Considerations

Welman and Kruger, (2005) state that ethical considerations arise at three stages of a research project, namely:

- When participants are recruited ;
- During the intervention or measurement procedure to which they are subjected; and
- In the release of the results.

Participation in this research was voluntary and the participants could withdraw at any time. Olivier (2004) indicates that a research which involves human participation should be reviewed by an ethics committee to determine whether the research should be allowed to continue or not. The research protocol was reviewed and approved by University of South Africa (cf Appendix C) and by the Limpopo Health Department (cf Appendix E). Informed consent was also requested from individual participants with regard to participation (cf Appendix D).

The data was collected in such a way that it interfered neither with the normal activities of the participants nor the routine activities of the hospitals. Above all, the hospital authorities at the hospitals were informed and permission was obtained from them before conducting the research (cf Appendix F, G and H). The participants were ensured of the confidentiality of the information they provided. Finally, the results of this research will be made available to the hospitals.

3.9 Conclusion

This chapter discussed the research methodology of the study described in the research design, research approach, data collection methods and data analysis techniques. The research design selected is qualitative research design employing a case study approach to achieve the research objectives.

Furthermore, the chapter highlights how the participants were purposefully selected from the various regions to achieve the research objectives. The methods of collecting data from the participants are stated as group interviews, questionnaires and document analysis. The chapter explains how the data analysis was carried out. Finally, measures to ensure trustworthiness of the research are discussed under the headings, credibility, transferability, confirmability and dependability. The next chapter discusses the research findings and data analysis.

CHAPTER 4: RESEARCH FINDINGS AND DATA ANALYSIS

CHAPTER 4

RESEARCH FINDINGS AND DATA ANALYSIS

4.1 Introduction

The research methodology was discussed in the previous chapter. This chapter discusses the data analysis and interpretation of the findings on electronic health records and e Referral processes. According to De Vos(2003) data analysis entails that the analyst break down data into constituent parts to obtain answers to research questions and to test hypotheses. The aim of data interpretation is to learn more about the population from which the sample is drawn (De Vos, 2003). Data interpretation is the most important key in proving or disproving your hypothesis. It is important to select the proper method to make useful interpretation of your data. If an improper data analysis method is selected, the research results may be suspect and lack credibility.

According to C. William Emory,(2002) “Interpretation has two major aspects namely establishing continuity in the research through linking the results of a given study with those of another and the establishment of some relationship with the collected data. Interpretation can be defined as the device through which the factors, which seem to explain what has been observed by the researcher in the course of the study, can be better understood. Interpretation provides a theoretical conception which can serve as a guide for the further research work”. Interpretation of the data has become a very important and essential process, mainly because of some of the following factors:

- Enables the researcher to have an in – depth knowledge about the abstract principle behind his own findings.
- The researcher is able to understand his findings and the reasons behind their existence.
- More understanding and knowledge can be obtained with the help of the further research.
- Provides a very good guidance in the studies relating to the research work.
- Sometimes may result in the formation of the hypothesis.

The purpose of interpreting data is to reduce it to an intelligible and interpretable form so that the relations of research problems can be studied and tested, and conclusions drawn. On the other hand, when the researcher interprets the research results, he/she studies them for their meaning and implications (De Vos, 1998)

For the purpose of this research study data was collected using interviews, questionnaires and documentation. The findings presented in this chapter are discussed in this chapter. The chapter is divided into two sections, the first section will interpret the findings and the second section will present the framework developed based on the findings.

4.2 Contextualizing the research question

As stated in chapter one, there are two sub research questions which this study aims to answer:

1. What are the processes of recording and storing of patient health records for referrals in hospitals at Limpopo?
2. How can Electronic Health Record Framework be compiled to improve patient referral process in these hospitals?

As this study requires an in-depth search and delving into the subject of the investigation for detailed information needed for better understanding and description of the processes multiple data collection methods were applied. Oates (2008) emphasizes that using multiple measuring methods assist the researcher to obtain more detailed information about the phenomenon under investigation. Interviews, self-administered questionnaires, and document analysis were used to collect data to answer the above research questions.

The main research question was further broken into two sub-research questions which are also addressed in this chapter. Measuring instruments such as interviews, questionnaires and document analysis were used in the data collection process. The use of multiple data collection methods was to provide an in-depth interpretation

of data collected. The table below, 4.1 presents the sub-research questions and the data collection method used.

Sub-research questions	**Data collection instruments**		
	Group Interviews	**Questionnaires**	**Document Analysis**
What are the processes of recording and storing of patient health records for referrals in hospitals in Limpopo?	√	√	√
How can Electronic Health Record framework be compiled to improve patient referral processes in these hospitals?		√	√

Table 4.1: Sub questions and data collection methods

4.3 Results dealing with sub question 1

The sub questions are stated in table 4.1. Sub question one is mentioned below:

1. What are the processes of recording and storing of patient health records for referrals at hospitals in Limpopo?

In order to answer this question, the three hospitals are first described and the summary responses to the interview and questionnaire which answer this sub question are stated below.

4.3.1 Description of hospitals

This section consists of the description of the three Limpopo public hospitals where the research was conducted followed by the summary of the interview and questionnaire findings.

The description of the three hospitals related to:

- Background history and settings of the hospital
- Existing ICT infrastructure and e-resources available

The background history and the settings of the hospitals as well as the existing ICT infrastructure and e-resources available were obtained from the hospital Administrators, Nurses and CIO's (Chief Information Officers) and through documents provided by the hospitals.

The next section discusses each hospital.

4.3.1.1 Elim Hospital

Background history and setting of the hospital

Elim hospital is situated in Limpopo Province only 20km east of Makhado(Louis Trichardt) close to the N1 . Elim is beautifully situated at the very northern edge of the escarpment and next to the Soutpansberg. The size of the hospital is 4.2km2 and it serves a population of approximately 530932. Several buildings in Elim hospital still commemorate the colonial style of the Swiss missionaries. Swiss missionaries started Elim Hospital in 1899. There is a museum within the hospital yard that is being renovated so that visitors can view and get a historical understanding of the hospital. This includes the history of the Swiss missionaries, Anglo-Boer War and the local chief, Njhaka-Njhaka, who leased the land to these missionaries for 100 years. The missionaries brought religion to the people of Njhaka-Njhaka and churches and schools were built for the community.

The hospital has always been well known for the good reputation of its optometrist division. People travel as far away as 350km for eye treatment here and it has now

been declared a National Monument since it celebrated its 100th year of establishment. The hospital has a total number of 41 doctors, one specialist and 504 nurses It consists of 16 consultation rooms for doctors, 11 general wards, one ICU ward, and one high care ward. The total number of beds in all wards included is 355.

Existing ICT infrastructure and e-resources available

The hospital has some basic information technology infrastructure in place. The hospital has a total number of 105 telephones that are distributed in the wards and hospital offices. The hospital has eight laptops that are mostly available for hospital management staff. It also has 100 desktops that are functioning, excluding all the others that are waiting to be repaired. There are five printers, three photocopiers and three fax machines. The operating system used on the laptops and desktops is Windows 7. The hospital has limited and even poor internet access which is mostly used for connecting to the program MEDICOM which the hospital uses for capturing patient basic details and for sharing the information within the Limpopo department of health hospitals. The poor internet connection makes the process of storing health records very slow, time consuming and ineffective. Data capturing also becomes slow and time consuming because of the system response time and the number of times that the server is down and the systems offline. The hospital has one sonar and two cat scan machines but no tv/video based and X-ray facilities. Table 4.2 below summarizes the hospital's ICT infrastructure.

Looking at the number of health professionals employed at the hospital, it is clear that the ICT equipment is not adequate or enough to ensure the effectiveness of IT and communication in general. The computers and laptops are mostly used by hospital administrators for capturing patients' health records and some hospital financial information.

4.3.1.2 Donald Fraser Hospital

Background history and setting of the hospital

Donald Fraser Hospital lies in the Vhembe district in the northern part of Limpopo Province. Vhembe is called the Land of Legend because of the fascinating culture of the Venda people who live there and its many historic and sacred heritage sites.

Vhembe has areas of dramatic mountainous scenery and vast tracts of wilderness. Donald Fraser Hospital is situated 30km north of Thoyandou, the main town in Vhembe and it serves a population of approximately 211583 and serves about 1475 people a week.

Donald Fraser Hospital has nine wards and approximately 349 beds and can accommodate 812 patients. There are also 11 consultation rooms for the 14 doctors that the hospital have and there is no specialist doctor in the hospital. The total number of nurses that the hospital has is 514 who are available at the hospital 24hrs daily in alternate shifts.

Existing infrastructure and e-resources available

The hospital has some basic information technology infrastructure in place. The hospital has a total number of 50 telephones that are distributed in the wards and hospital offices. The hospital has eight laptops that are mostly available for hospital management staff. It also has 53 desktops that are functioning, excluding all the others that are waiting to be repaired. There are 25 printers, two photocopiers and scanners. The operating system used on the laptops and desktops is Windows 7. The hospital has limited and even poor internet access which is mostly used for connecting to the program MEDICOM which the hospital uses for capturing patient basic details and for sharing the information within the Limpopo department of health hospitals. The poor internet connection makes the process of storing health records very slow, time consuming and ineffective. Data capturing also becomes slow and time consuming because of the system response time and the number of times that the server is down and the systems offline. The hospital has no sonar equipment, cat scan equipment, tv/video based and X-ray facilities. Table 4.2 below summarizes the hospital's ICT infrastructure.

Looking at the number of health professionals employed at the hospital, it is clear that the ICT equipment is not adequate or enough to ensure the effectiveness of IT and communication in general. The computers and laptops are mostly used by

hospital administrators for capturing patients' health records and some hospital financial information.

4.3.1.3 Tshilidzini Hospital

Background history and setting of the hospital

Tshilidzini Hospital is a regional hospital in the Vhembe district in the northern part of Limpopo Province. It is situated 5km from the town of Thohoyandou and it is easily accessed from the main road between Makhado and Thohoyandou. Tshilidzini Hospital was initially opened by the Dutch Reformed Church in 1958 as a missionary hospital. It was later taken over by the former Bantustan of Venda in 1979 and re-integrated into South Africa in 1994. It serves a population of approximately 1.3 million people; this includes clinics, health centres and district hospitals . The hospital refers about 90 people per month to different hospitals.

Tshilidzini Hospital has 13 wards and approximately 350 beds and can accommodate patients to full capacity at any given time. The hospital has 54 doctors and five specialists. The total number of nurses that the hospital has is 620 who are available at the hospital 24hrs daily in alternate shifts.

Existing infrastructure and e-resources available

The hospital has some basic information technology infrastructure in place. The hospital has a total number of 260 telephones that are distributed in the wards and hospital offices. The hospital has 53 laptops that are mostly available for hospital management staff. It also has 120 desktops that are functioning, excluding all the others that are waiting to be repaired. There are 30 printers, two photocopiers and two scanners. The operating system used on the laptops and desktops is Windows 7. The hospital has limited and even poor internet access which is mostly used for connecting to the program MEDICOM, which the hospital use for capturing patient basic details and for sharing the information within the Limpopo department of health hospitals. The hospital also uses IBA for patient billing information and District

Information System (DHIS). The poor internet connection makes the process of storing health records very slow, time consuming and ineffective. Data capturing also becomes slow and time consuming because of the system response time and the number of times that the server is down and the systems offline. The hospital has two sonar machines but no cat scan equipment, tv/video based and X-ray facilities. Table 4.2 below summarizes the hospital ICT infrastructure.

Looking at the number of health professionals employed at the hospital, it is clear that the ICT equipment is not adequate or enough to ensure the effectiveness of IT and communication in general. The computers and laptops are mostly used by hospital administrators for capturing patients' health records and some hospital financial information.

	Elim hospital	**Donald Fraser hospital**	**Tshilidzini hospital**
Laptops	8	8	53
Desktops	100	53	120
Scanners	0	4	2
Printers	5	25	30
Photocopiers	3	2	2
Telephones	105	50	260
Cat Scan Equipment	2	0	0
Sonar Equipment	1	0	2
TV based video conferencing equipment	0	0	0
PC based video conferencing equipment	0	0	0
Web cam digital cameras connected to the laptop/PC	0	0	0
Computers connected to digitalized X-ray equipment	0	0	0
Computers connected with high resolution digital camera monitored on microscope	0	0	0
Internet Access	Yes	Yes	Yes

EHR system	Yes, Medicom	Yes, Medicom	Yes, Medicom
e-Referral system	No	No	No
Email facilities	Yes	Yes	Yes

Table 4.2: Summary of ICT infrastructure

4.3.2 Group Interviews Findings

Data collection process included interviews. Interviews were conducted with health workers who are involved with the day to day activities of creating patient records and administering patient referrals. As shown in Table 4.3 below, the respondents included hospital administrators, CIO and nurses from the hospitals. The interviews were intended to find out the current process of electronic health records and patient referral. Furthermore, it was important to determine whether the current process was a success or not. The interviews were conducted English, Tshivenda and Xitsonga.

	Elim Hospital	**Tshilidzini Hospital**	**Donald Fraser Hospital**
Nurses	2	2	2
Administrators	2	2	2
CIO(Chief Information Officer)	1	1	1

Table 4.3: Demographics of Interviewees

The responses are summarised in table 4.4 below. The table consists of the summary of responses from the group interviews in the three hospitals.

Interview questions	**Summarized responses**
How will you benefit if patient electronic health record system is improved in your hospital and an e-referral system is implemented?	It will save time spent in recording the patient details, diagnosis and treatment of patients. Time in retrieving information from files will also be saved. E-referral will provide efficiency and a quick process of referring a patient as doctors will not have to write patient diagnosis

	more than once. **Respondent 1:**" *Some file storages are too far, it will save time spent on walking*" **Respondent 2:** "*If we have one system that can assist in communicating with other hospitals, it will not take a long process to refer a patient because there will be no need to recreate files at the receiving hospital.*"
Do you foresee any challenges if a new electronic health record system is implemented for record keeping and e-referral?	Electricity power failures and lack of technical and system support and maintenance. **Respondent 1:** *"Electricity, we get electricity outages often, If we are offline it will be a problem"* **Respondent 2:** "*The problem is that we do not get support for these computers and programs, the support team is not on our hospital premises."*
What are the ICT resources you wish to have that can be useful to the hospital for patient record keeping and e-referral?	Laptops, computers, printers and photocopiers, scanners and faster broadband internet connection.
Do you have any comment, issues or concerns you would like to raise?	Training and computer illiteracy were raised as great concerns. **Respondent 1:** *"We need to be trained to use this new technology."* **Respondent 2**: *"Not all of us can use computers, we will need basic computer training in order to use these systems"*

Table 4.4 Summary of interview findings

4.3.3 Questionnaires Findings

Self-administered questionnaires were distributed by hand to the participants accompanied by a letter of approval to conduct the research and a consent form with an explanation of the research and a research proposal were attached to the questionnaires. The questionnaires were divided into two sets. The first set of questionnaires consisted of three sections and it was targeted for hospital administrators and CIO's while the second set of questionnaires had two sections and targeted for nurses. Table 4.5 below depicts the summary of the questionnaire findings.

Number	Questionnaire Questions	Summarised Responses
Background, settings and IT Infrastructure of the hospital		
Q6	Does the hospital provide any ICT application for E-Health record and E-Referrals? Yes or No	There is a basic ICT application for electronic health records but not for e-referrals.
Q7	What computer hardware/technology does the hospital have?	The hospitals have a very limited number of laptops, computers, photocopiers, scanners, printers, fax machines, cat scan equipment, X- ray machines and no TV based and video conferencing equipment.
Q8	What is the standard operating system installed on the laptops and PC's? (e.g. Windows 7, Windows 95, Windows XP)	Windows 7
Q9	Does the hospital have internet access?	Yes, but the internet is mostly offline
Q10	Do you have emailing facilities?	Yes
Q11	Do you have a software/program for e-health record and e-referrals? Yes or No	Yes for e-health record (MEDICOM) and no for e-referrals
Q12	Do you have in-house training for staff? Yes or No	No, people train each other.
Q13	Please state the type of IT	Computers, printers, scanners to

	equipment that you think is needed in the hospital and why. (e.g. Computer, Printer, etc.)	increase efficiency and save time.
Q14	Are there any ICT plans or vision for the future of the hospital?	Yes, the NHI (National Health Insurance) has future ICT plans for all hospitals
Services provided by the hospital		
Q17	Is there a hospital of preference that you normally refer patients to? Yes or No	Yes, Mankweng hospital in Polokwane
Communication with other hospitals		
Q19	How often do you communicate with other hospitals?	Daily
Q20	What communication medium is used to communicate with other hospitals?	Email, letters and telephones
Q21	What are the main topics you communicate with other hospitals?	It ranges from different topics, patent related info, admin related info, information sharing, workshops, patient referrals, etc.
General Overview		
Q4	Do you share patients' health records with other healthcare practitioners in wards or other hospitals?	Yes, in wards but not with other hospitals
Q5	What type of ICT system are you currently using for creating patient health records?	E-HIS MEDICOM
Q7	Is there a central place/system for creating and maintaining patient health records? Yes or No	Yes, in a storage room
Q8	Are the patient health records stored electronically or by handwritten?	Both electronically and hand written

Q9	State the staff responsible for recording patient health records.	Admin Clerks
Q11	What is the average time spent per day for creating and maintaining patient health records?	24 hours
Q13	What is the standard format of storage? (alphabetically, date, numerically)	Alphanumeric
Q14	Name the categories of staff that have authorization to access patient health records.	Admin Clerks
Q16	Do you think the current patient health record system provides accurate and complete information?	Not completely
Q17	Is the quality and format of information effective for sharing between healthcare professionals? Yes or No	No
Q18	Does the current patient health record storage process save time? Yes or No	No
Q19	Does the current patient health record storage process provide confidentiality? Yes or No	Yes
Patient Referral		
Q21	Do you think collecting and recording of patient health records electronically will be beneficial to the hospital for patient referrals? Yes or No	Yes
Q25	Is the patient health record information re- created when the patient is referred to another ward or a new hospital? Yes or	Yes

	No	

Table 4.5 Summary of questionnaire findings

4.3.4 Document Analysis Findings

Document sources were used as one of the important sources for collecting data. The hospitals provided documents to show the format they use to keep health records. The information provided did not disclose any confidential information. This comprised of the patient health record files and the documents maintained when referring a patient to another hospital. Documents containing hospital reports were also provided. Several documents prepared by the Department of Health were also provided relating to electronic health records for South Africa and one specific document adopted by the hospitals in relation to electronic health records comprised of the following goals and objectives:

Goals

- To integrate health record systems in the country by bringing together all the different health information systems facilitating access to health records within a province and across provinces.
- To develop a population health care base.
- To improve administration at both national and provincial level.
- To improve the efficiency of health service delivery.
- To enable national monitoring and evaluation of health trends.

Objectives

- Integrate different episodes into individual longitudinal records
- Track patients for continuing health care
- Reduce medical errors
- Provide easy access to records
- Improve referral system
- Monitor health care behaviours

- Promote transparency and efficiency
- Improve surveillance methods

Through spending time at the hospital and viewing the documents provided by the administrators, CIOs and nurses the information depicted in the table 4.6 below was elicited.

Documentation Topic	Documentation Summary
Patient electronic health record	The hospitals currently use MEDICOM health information system for capturing and storing and retrieving patient health records. The system is not completely useful as it does not record all the information relating to a patient. Information such as patient visits and clinical information is not captured electronically.
Electronic referral	Patient referral process from one hospital to the other or from one ward to the other is explicitly manual with no formal process. The system is paper based and time consuming, patient information is captured from scratch when a patient is transferred.
ICT resource availability	There is a vast shortage of computer equipment (photo copiers, fax machines, scanners, printers, desktops and laptops)
ICT Infrastructure	The current IT infrastructure does not support the minimum IT equipment that the hospitals currently have.
ICT challenges	The following are the key challenges Computer illiteracy, no broadband coverage, lack of computer equipment, poor internet connectivity, lack of IT support, electricity and power interruptions

Table 4.6: Summary of document analysis

4.3.5 Summary of interview, questionnaire and document analysis findings

The findings obtained from interviews, questionnaires and document analysis are summarised in this section as indicated by the responses for each hospital. The findings for each hospital are in relation to the following points:

- Patient data collection and recording procedures for referral processes
- The willingness of using electronic health record and e-referral of patients

Patient data collection and recording procedures for referral processes

Limited data related to electronic health records is recorded electronically using MEDICOM. Information relating to patient referrals and diagnosis amongst other patient details is not recorded electronically and still hand written and stored on files in filing cabinets. Referring patients to other wards/ hospitals is a manual process where there is no format even on paper for referring/transferring patients but the out-patient clerk designs or formulates a method that is workable to manage the patient referral process. An electronic health record system will save time for recording patient information, improve communication and provide confidentiality of patient health records. Doctors at the referred hospital will also save time as they will not have to re-write a patients clinical history. The process of following up on a patient with the referred hospital will also be simplified through checking progress online.

The willingness of using electronic health record and e-referral of patients

The respondents have shown incredible interest in the willingness of using ICT to record complete information relating to patients. They have expressed that having a full 360 overview of patient health records including referrals will be highly beneficial to the organisation. The concerns raised are the IT infrastructure to allow the effectiveness of the electronic health record system.

4.4 Analysis and Interpretation

This section represents a thematic analysis by considering the summarised responses from questionnaires and interviews for all the three hospitals. Creswell (2009) refers to this form of analysis as cross-case analysis. Yin(2009) indicates that in cross-case analysis, the researcher investigates more than one case to examine themes across the various cases in order to discern themes that are common to all the various cases. Thematic analysis considers more than one case to examine themes common to all cases. According to Braun and Clarke (2006) thematic analysis is a qualitative analytic method for identifying, analysing and reporting patterns (themes) within data. It minimally organises and describes your data set in rich detail. However, frequently it goes further than this, and interprets various aspects of the research topic. A theme captures something important about the data in relation to the research question and represents some level of patterned response or meaning within the data set. The themes in this research were formed by looking at cross-case, within-case and holistic-case (cf.3.1). This is supported because more than one case in order to examine themes common to all the cases. Table 4.7 below shows the summary of themes to answer sub research question 1.

Number	Themes
1	Background, settings and IT Infrastructure of the hospital
2	Patient data collection and recording procedures for referral processes
3	The willingness of using electronic health record and e-referral of patients

Table 4.7: Summary of research themes

The common themes found in the responses of the analysis of electronic health record and e Referrals through interviews, questionnaires and document analysis are summarised below under the following points:

- **Background, settings and ICT Infrastructure of the hospital**

The findings reveal that there are a limited number of computers and laptops in the hospitals (cf 4.3.1 and table 4.2). Doctors and nurses are not provided with laptops and desktops. This clearly confirms that doctors and nurses do not use computers for their daily clinical work. Computers are available for hospital administrators and other offices of management. The computers are primarily used for capturing patient personal information and revenue collection. Management use computers for other tasks not related to clinical work. The hospitals do not have enough basic ICT equipment such as printers, photocopiers and fax machines (cf 4.3.1 and table 4.2). This will result in a massive cost injection if electronic health record solutions are to be implemented (cf table 4.4 and table 4.5). There is poor internet activity, lack of prompt technical and application IT support and lack of basic ICT skills amongst health professionals. Many health workers indicated that they need basic computer skills training.

- **Patient data collection and recording procedures for referral processes**

HIS (Health Information System) has been implemented in the three hospitals which this research is based on. Medicom is the electronic health record system that is currently used in these hospitals and the broader Limpopo public hospitals. However, the patient details are first hand written by pen and paper and then later transferred to the system. This is time consuming and not efficient as it is sometimes not clear to interpret what has been written. Medicom stores basic patient details but excludes the clinical and diagnosis details relating to the patients. The electronic health record system is used by administrators to capture certain but minimum patient personal details. Doctors and nurses use pen, paper and files to record patient diagnosis and other clinical information. These files are collected and kept in a storage room in filing cabinets that are organised in alphanumerical order which includes dates to ease the process of locating the files when patients revisit the hospital. However it is time consuming and difficult to retrieve the patient records files due to large volumes and minimum storage space available in the records room. The file number is also stored in the electronic health record system (Medicom) to make it easy to track the file number (cf table 4.4, table 4.5and table 4.6).

There is no e Referral system in the hospitals when we reference to what the definition of e-Referral is; To refer is “to direct somebody to somebody or somebody else for information, help, treatment or judgment”. E-referrals means the transmission of an electronic document, such as a text document or PDF which can be received and viewed by the referee on their computer. The e-referral message is generated from the referrer’s computer, ideally by the referral being auto-populated with information directly from the referrer’s records about the patient. The message is then securely transmitted to the referee (DHS, 2006). Referrals in the hospitals are facilitated through hand written paper (cf section 4.3). When a patient is referred from one department to the other within the same hospital, the patient’s file is retrieved and given to the patient to produce at the receiving department in order to be assisted. In a case where a patient is referred from one hospital to the other, the process is paper based. Once the doctor has informed the patient that they have been referred to another hospital, the following steps are followed:

1. The patient goes to the out-patient booking area
2. The patient provides personal details including the referred hospital
3. The out-patient clerk records the referral in the out-register book
4. The out- patient clerk completes a trip authorisation form
5. The out- patient clerk completes vehicle request form and arranges for patients to be transported.
6. The out-patient clerk books referral with the receiving hospital

Upon arriving at the receiving hospital, patients follow long queues for a new file to be created before they can be attended. The doctor who receives the referred patient starts from scratch with the patient diagnosis. This process is time consuming (cf table 4.4 and table 4.5).

Figure 4.1 below summarises the steps that are followed in referring a patient

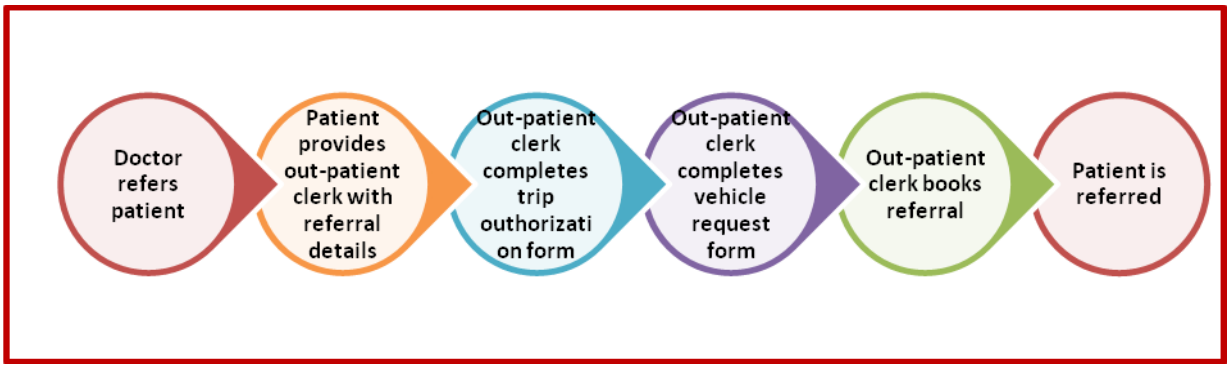

Figure 4.1 Process of referring a patient

- **The willingness of using electronic health record and e-Referral of patients**

The healthcare professionals in the hospitals expressed their willingness and acceptance of EHR and e-Referral solutions if implemented in their hospitals. They stated that EHR and e-Referral solutions would improve their job performance and save time. This is confirmed by the positive attitude and the positive comments expressed by the respondents about how helpful EHR solutions will ease their routine job activities (cf Table 4.4 and Table 4.5). This is in agreement with Ojo et al., (2006) who indicates that acceptance and use readiness is the intention to accept and use e-health technologies and this is measured by the attitude towards using ICT for healthcare management. Furthermore healthcare professionals indicated their willingness to undergo training in the use of ICT facilities and EHR solutions if these are implemented.

With reference to Section 2.15, Lanseng and Andreassen (2007), explain in their TAM that when users are presented with a new technology, two notable factors influence their attitude towards using the application. These are its perceived usefulness and its perceived ease of use. Davis (1989) explains that perceived usefulness refers to the degree to which a person believes that using the particular system will enhance his job performance, while perceived ease of use refers to the degree to which a person believes that using a particular system would free him or her from effort (*cf* Figure: 2.7).

4.5 Compilation of electronic health record framework

In order to answer the research sub question two:

How can an Electronic Health Record Framework be compiled to improve patient referral processes in these hospitals?

An e-health record database and e-referral framework are compiled in this research. The compilation is based on the analysis and findings from the case study. A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used (Yin, 2009).

The findings indicated that patient health records (cf section 2.2) are first recorded on paper and later captured into the Medicom system by the administrators. The improvement of the current health information system (Medicom) for electronic health records can promote efficiency of the EHR thus improving the health system and electronic referrals.

The Findings further revealed that the hospitals are equipped with ICT equipment such as computers, laptops, printers, photocopiers, and scanners. The hospitals also have internet facilities which are mainly used for searching information and sending emails and not for facilitating EHR solutions and supporting these solutions.

Furthermore, the findings reveal that the health professionals are eager to have the current EHR system improved and have an e-Referral system implemented in their hospitals. The hospital health care professionals believe that EHR and the e-Referral system will improve job performance and save time. These findings are supported by the respondents' responses in table 4.4 and table 4.5. A framework (see figure 4.2 and figure 4.3) was developed to support this initiative. The framework is aimed at improving the current electronic health record system and provides an e-Referral process.

4.5.1 Electronic Health Record Database

Implementing an Electronic Health Record database will provide the patients and their clinical providers with secure, integrated access to their unique patient records throughout the Vhembe district and the rest of the province. The EHR will provide a secure and private lifetime record of an individual's health and care history which will be available electronically to authorized health providers. The EHR will consist of a variety of components including the components illustrated in figure 4.2 below. The EHR which hosts the Patient health record will serve as an electronic file of the patient. The electronic patient file will be the transferable document within and between hospitals.

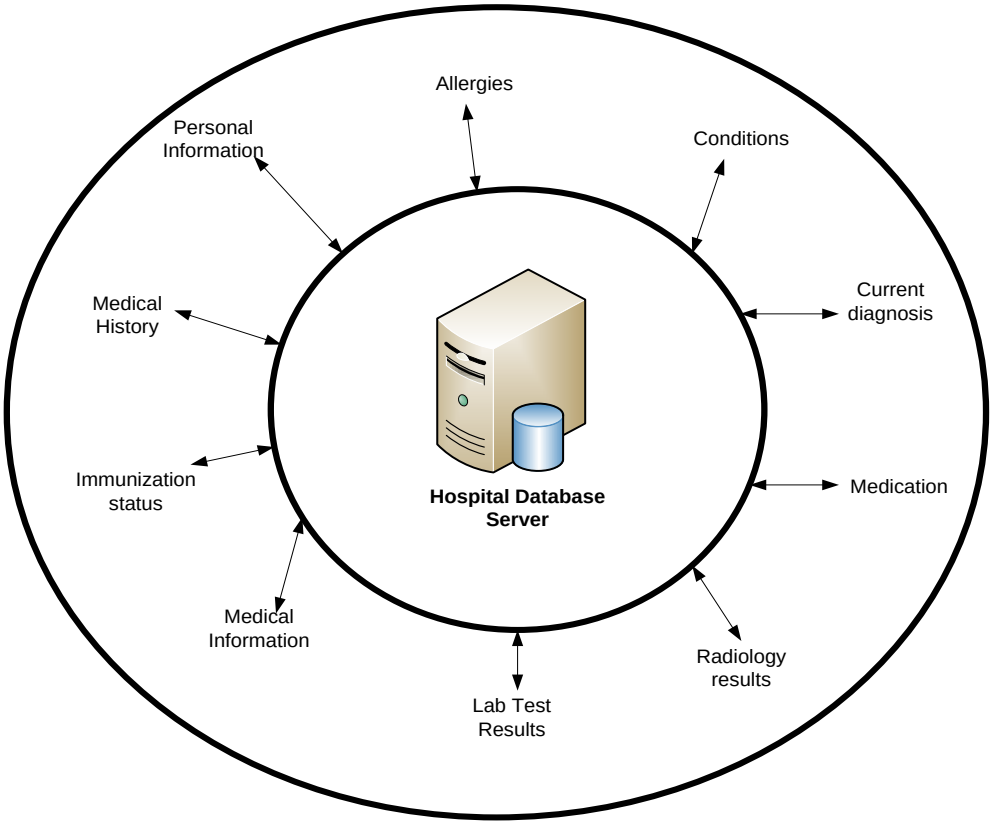

Figure 4.2: EHR database

The information depicted in figure 4.2 will be captured by the hospital health professionals when a patient is attended at the hospital. Doctors, nurses and administrators will be amongst the health professionals who will be responsible for capturing this information. The information regarding a patient's health record will be stored in the hospital database server and will be available to be accessed by any

authorised personnel when needed. The same information will be available for e-Referral discussed in the next section 4.5.2. The information will be available because the framework is dependent on the information provided in the EHR database (cf figure 4.2). The same information will be available to be shared between the referring hospital and the specialist hospital.

4.5.2 E-Referral Framework

From the literature (section 2.13) the current patient referral process was discussed. After obtaining a basic understanding of the referring hospital and specialist hospital relationship, reasons for patient referrals and the traditional patient referral process, a web-based patient electronic referral system, also known as patient e-Referral system, is proposed to replace the cumbersome and problematic paper-based referral system (cf section 2.11).

Figure 4.3 below is a proposed framework for referring a patient using an electronic patient referral system. The process starts when a patient visits a doctor at the referring hospital, in this case Elim hospital, Tshilizini hospital or Donald Fraser hospital and the patient needs to be referred to a specialist hospital, in this case within the same hospital or outside the hospital (e.g. Mankweng hospital in Polokwane). The doctor will request the patient's health record through the implemented hospital EHR. The doctor states the patient diagnosis and updates the patient medical record. The referral clerk is alerted of the patient referral at the referring hospital. The referral clerk initiates and sends the patient's medical summary to the specialist hospital through a hospital web service that facilitates communication between the different hospitals.

The clerk at the specialist hospital receives the referral message and confirms receipt by sending back an acknowledgment message to the referral clerk. The doctor at the specialist hospital attends to the patient and updates the patient's diagnosis and medical information in the EHR system. The web service sends a

message back to the referring hospital that the patient has been attended to and the process is completed. The same e-Referral process is also followed within the same hospital to transfer patient between different hospital departments.

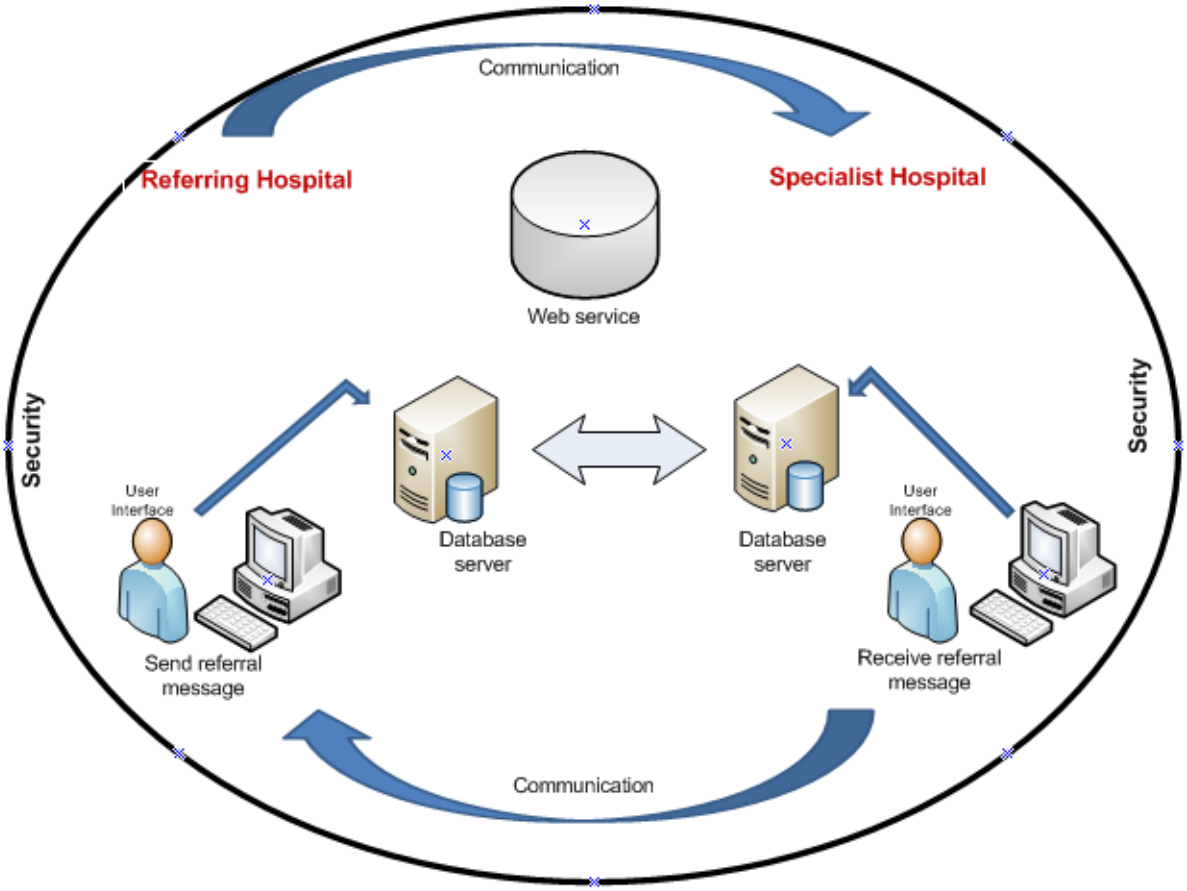

Figure 4.3: e-Referral Framework

The various components of the e-Referral framework and their functionalities are discussed.

- **Database:** The database is a collection of data organized in a manner that allows access, retrieval and use of data. The stored data underpins a specific application and each application is run by specific software called application software that allows the users to create access and manage the database

- **User interface component:** It provides interaction between the user and the application. The user interface components handle the rendering of data for

particular end user devices such as PDAs and mobile phones as well as computer devices such as PCs and terminal devices.

- **Security:** The implementation of e-health solutions in the context of the e-health framework must be done in a secure environment. This means that there should be reliable, secure user identification, authentication and authorization. The issue of security and confidentiality of patient information became evident during the fieldwork and therefore, it is important that such identification measures are put in place. One of the respondents stated that there should be signatures and passwords so that "if something goes wrong we know who did what".

- **Communication:** This is concerned with the interaction between components across the different layers. In the communication layer, an appropriate transport protocol, such as HTTP for Internet communication and TCP for intranet communication are considered for sending messages. All the components of the PEHF communicate through a shared network infrastructure using an agreed service protocol. An HL7 messaging standard has been adopted as the messaging standards for the healthcare sector in South Africa. However, there are plans to move to a XML based standard for messaging requirements

4.6 Conclusion

This chapter discussed the interpretation of findings from the three hospitals. A framework aimed at improving the current electronic health record system was compiled. An e-referral framework was also compiled.

Furthermore the findings of this study further indicate that the hospitals need to improve on their current electronic health records and electronic referral processes. The improvement on these processes require ICT infrastructure to allow EHR and e-Referral to be possible. Hardware structures will need to be improved as well.

Extensive improvement on the broadband to support internet coverage will need to be improved. Another recommendation includes the encouragement of health workers that will use the EHR and e-Referral systems to empower themselves and take the initiative in using the systems to the full benefit. The next chapter will discuss the summary, reflection and conclusion.

CHAPTER 5: SUMMARY, REFLECTION AND CONCLUSION

5.1 Introduction

5.2 Summary of the study

5.3 Evaluation of the study

5.4 Contribution of the research

5.4.1 Theoretical Contribution

5.4.2 Practical Contribution

5.5 Recommendations

5.6 Benefits of the study

5.7 Further Research

5.8 Conclusion

CHAPTER 5

SUMMARY, REFLECTION AND CONCLUSION

5.1 Introduction

In achieving the objectives of the study, questions were formulated, which were used to collect data from several sources. Some of the instruments used were interviews, questionnaires and documentation. The data was transcribed and documented. A case study approach was used in the analysis of the data. The details of the research objectives and questions, including methodology, are discussed in Chapter one and repeated in Chapter three.

Findings from the analysis of the data were interpreted and presented in chapter four respectively. Based on the analysis, findings and interpretation, a framework was compiled aimed at implementing an improved electronic health record and an e-Referral system in the hospitals.

The purpose of this chapter is to draw some conclusions from the study. The chapter is divided into seven main sections. The first section is the summary of findings. The second section is the evaluation of the research. The third section presents the contributions of the research. The forth section offers some recommendations. Benefits of the study are covered in the fifth section. Suggestions for further research are provided in the sixth section and the seventh section provides conclusions.

5.2 Summary of the study

The study is divided into five chapters. Each chapter addresses a distinct area of the study. The chapters are recapitulated as follows:

Chapter 1 introduces the complete research as documented in the study. This chapter provides the introduction to the study, including the problem statement and research question addressed by the study, the research objectives of the study, the

methodology applied in the study, the underpinning theory applied in data analysis and the conclusion. The chapter also provides an overview of the entire study and how the dissertation is organised.

Chapter 2 – This chapter discusses the literature review on the Electronic Health Record system and electronic referral process, whereby explanations are provided in detail by discussing the definitions, goals, objectives, processes and process flows, benefits, components, usage, barriers and challenges, record keeping and management.

Chapter 3 – This chapter discusses the research methodology of the study described in the research design, research approach, data collection methods and data analysis techniques.

Chapter 4 - Findings from the analysis are interpreted and analysed in this chapter. Based on the findings and interpretation, a framework was compiled. The framework is aimed at improving EHR and e-Referral processes.

Chapter 5 - The last chapter summarises all the chapters of the dissertation and provides an evaluation of the study. In addition, the chapter presents the theoretical contributions of the study and covers the recommendations and suggestions for further research.

5.3 Evaluation of the study

The conclusions drawn are from the research findings of this study. The research findings are also obtained as the results from the answers to the research sub questions:

1. What are the processes of recording and storing of patient health records for referrals in hospitals in Limpopo?

2. How can an Electronic Health Record Framework be compiled to improve patient referral processes in these hospitals?

The research questions were formulated to achieve the purpose of the research which was to investigate and understand the current process of patient record keeping and management, and referral processes of patients within the same hospital and to other hospitals and based on the findings compile an electronic health record framework to aid e-Referral processes.

The following objectives were formulated to answer the research questions:

- To investigate and review the current patient record keeping process
- To investigate the current patient referral process
- To identify the risks involved in the current process
- Compile an EHR framework to aid e-referral processes in the hospitals

Regarding the objectives of the study, the following was established:

- The current EHR system does not provide satisfactory results
- There is no existing e-Referral system
- Many challenges such as data inconsistency, loss of information, etc exist.
- Compilation of a framework to assist in the current EHR and e-Referral processes is key for this research

Qualitative research, commonly known as interpretive research was used in this study as the researcher's aim was to investigate and see the world from the eyes of the participants while striving to understand the current EHR process and e-Referral processes.

A case study was also used because it provides an understanding of a situation and can add strength to what is already known through previous research. The visits to the different hospitals to investigate and obtain information supports the fact that the case study approach was relevant for this study. Researcher Robert K. Yin(2009) defines the case study research method as an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used. This supports that a case study was appropriate.

The participants were supportive and provided answers to the questionnaires prepared for them and also answered the interview questions with adequate information to allow for the compilation of the EHR and e-Referral frameworks. The findings in chapter four clearly indicate that there is an existing EHR in the hospitals in question, Medicom, however the system is not used to the full extent of its capability as there is poor internet coverage of the systems due to lack of electricity, illiteracy, broadband coverage and system support, just to mention a few. The main concern is the infrastructure to allow the implementation of a successful EHR and e-Referral system which can cost billions. This research has indicated that there is a lack of ICT hardware such as computers, printers, photocopiers, scanners, etc. in the hospitals. The current infrastructure does not allow the hospitals to be ready for the EHR and e-Referral system.

However, the NHI that the National Department of Health has planned as an e-Health strategy for South Africa will facilitate an improved health care quality and implement an effective EHR system which will integrate not only Limpopo hospitals, but all national public hospitals and thus improve the current processes.

5.4 Contribution of the research

This section presents the contribution of the research from both a theoretical and practical perspective

5.4.1 Theoretical Contribution

In chapter two, the researcher discussed the existing theories from previous researchers and these became the foundation of this research. The theory was applied to identify the challenges, gaps, improvements and benefits in relation to EHR and e-Referral. The research findings of the studies added a new theoretical contribution to the existing body of knowledge in terms of patient electronic records and processes of patient referrals in rural communities.

5.4.2 Practical Contribution

Previous research studies have provided critical components that are imperative in compilation of the electronic health record and electronic referral frameworks. The different challenges and concerns are outlined in this research. The research confirms the importance of compiling a framework to improve patient health record keeping and patient referral processes. The **E-Referral Framework** which serves as the practical contribution from this study will improve the current patient electronic health record and patient referral process and satisfy the needs of public hospitals in Limpopo Province.

The Limpopo Department of Health was contacted after the framework was developed and the department plans to pilot this on a small scale to see if this can be beneficial to the department after all relevant approval processes are obtained.

5.5 Recommendations

The findings of this study indicate that the hospitals need to implement the proposed electronic health records and electronic referral processes. The improvement on these processes require ICT infrastructure to allow EHR and e-Referral for it to be possible. Hardware structures will need to be improved as well. Extensive improvement on the broadband to support internet coverage will need to be improved. Another recommendation includes the encouragement of health workers that will use the EHR and e-Referral systems to empower themselves and take the initiative in using the systems to their full benefit.

5.6 Benefits of the study

The benefits of the EHR and e-Referral implementation will include among others fewer medical errors, operational efficiencies, and better access to patient information. Furthermore, quicker access to patient history, and proper storage and management of patient files will be a huge benefit. Participants stated that it would be of great benefit if the interpretation of hand writing as a means to determine communication was eliminated. Having access to historical data without locating and searching through paper files is also of great benefit. Using an EHR system will provide the health care professionals with consistent access to patient information. In addition to these benefits, it will save the provincial health department a huge sum of money in its health budget.

5.7 Further Research

This study was thoroughly carried out within the scope presented in Chapter one. The findings and the analysis of the study outlined the current electronic health record processes and patient referral processes and a framework was compiled to improve the processes. However, there is a need for further research for the items that were not in the scope of this research but needs more investigation. The study makes the following suggestions for further research:

EHR and e-Referral Competency- As indicated in this study, health professionals did not have hands-on experience to an EHR and e-Referral; further studies can be conducted after health professionals have had the opportunity to use EHR and e-Referral systems to measure their attitudes about the EHR and e-Referral system usage. This could be done after using the system for a few years.

Post implementation Issues- After the implementation of any project it is normal to have on boarding issues. It will be beneficial to conduct further research in this regard to identify these issues and provide a solution to overcome them.

5.8 Conclusion

This chapter presents the conclusions made from the findings of this study. Through this research study it was established that the adoption of patient electronic health records and electronic referral is increasingly becoming an essential part of the effort to improve quality of care, shortened waiting time, enhanced interoperability, improved user satisfaction, reduced high cost of paper-based systems, promoted use of standards, and many more. E-Referral should be a subsequent system and be linked to an electronic health record database to allow direct access to health care professionals who will be responsible for e-Referrals.
Subsequent to the investigations and findings of this study a framework for electronic health records and electronic referrals have been compiled to enable the hospitals to provide improved quality of health care. The investigations outlined the following challenges amongst many:

- ICT infrastructure
- Lack of ICT hardware
- Electricity power failures
- Limited broad band coverage
- Lack of post implementation support

To overcome the challenges above and implement the proposed framework, large amounts of money which is estimated to billions is required. However, the scope of this study excluded the costing related to the implementation of the compiled frameworks.

In conclusion, the health care industry will benefit greatly from the implementation of electronic health records and the e-Referral system.

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Appendix A

Questionnaire for Hospital Administrators

About this questionnaire

All information will be treated as confidential. The completion of this questionnaire is voluntary and your participation will be highly appreciated

Aim: The purpose of this questionnaire is to establish the:

- Background history and settings of the hospital
- Existing infrastructure and e-resources available

Section A: **Background, settings and IT Infrastructure of the hospital**

1. Briefly describe the geographical location of your hospital by responding to the questions below:

Name of hospital_____

Postal Address_____

Street Address_____

Province_____

Magisterial District_____

Telephone Number_____

2. What is the size of the population your hospital serves?

_____

3. What is the size (km2) of your hospital?

_____

4. How many doctors and nurses does your hospital have?

Doctors_____

Nurses_____

Specialists_____

5. Does every hospital ward have a telephone? Yes or No

_____

If no, how many wards do not have?

_____

6. Does the hospital provide any ICT application for E-Health records and E-Referrals? Yes or No

E-Health record_____

E-referrals_____

7. What computer hardware/technology does the hospital have?

Please write the number in the space provided.

Item	**Number**	**Item**	**Number**
Desktops		Cat Scan Equipment	
Monitors		Sonar Equipment	
Laptops		TV based video conferencing system	
Scanners		PC based video conferencing system	
Printers		Web cam digital cameras connected to the laptop/PC	
Photocopiers		Computers connected to digitalized X-ray equipment	
Telephones		Computers connected with high resolution digital camera monitored on microscope.	

7. Please state the number of consultation rooms and beds in the hospital.

Please write the number in the space provided.

Item	**Number**
No of consultation rooms for doctors	
No of consultation rooms for specialists	
No of general wards	
No of ICU wards	
No of High Care wards	
No of beds in general wards	
No of beds in ICU wards	
No of beds in High Care wards	
No of Theatres	

8. What is the standard operating system installed on the Laptops and PC's? (e.g. Windows 7, Windows 95, Windows XP)

_____

9. Does the hospital have internet access?

_____

10. Do you have emailing facilities?

_____

11. Do you have a software/program for the following? Yes or No

E-Health record_____

E-Referrals_____

If Yes, please state the software/program

Item	Software/Program
E-Health record	
E-referrals	

12. Do you have in-house training for staff? Yes or No

_____

If yes, what is the software/program used? Please state

_____

13. Please state the type of IT equipment that you think is needed in the hospital and why. (E.g. Computer, Printer, etc.)

_____

14. Are there any ICT plans or vision for the future of the hospital?

_____

Section B: **Services provided by the hospital**

15. During a normal week of practise, how many patients do you see?

_____

16. During a normal week of practise, how many patients do you refer to another hospital/ ward?

_____

17. Is there a hospital of preference that you normally refer patients to? Yes or No

_____

If yes, state the hospital below

_____

18. During a normal week of practise, how many patients do you have in the wards?

Ward	Number
General ward	
High Care	
ICU	

Section C: **Communication with other hospitals**

19. How often do you communicate with other hospitals? Mark with X

Weekly	Monthly	Quarterly	Half yearly	Yearly	Other(Specify)

20. What communication medium is used to communicate with other hospitals? Mark with X

E-mail	Printed Letters	Telephone	Workshops	Meetings	Other(Specify)

21. What are the main topics you communicate with other hospitals?

_____

22. How is your relationship with other hospitals? Mark with X

Excellent	Very Good	Good	Poor	Very Poor	Other(Specify)

The End

Thank you for your participation

Appendix B

Questionnaire for Nurses and /or Doctors

About this questionnaire

All information will be treated as confidential. The completion of this questionnaire is voluntary and your participation will be highly appreciated

Aim: The purpose of this questionnaire is to determine the:

- Patient data collection and recording procedures for using E-patient health records and e-Referrals
- The willingness of using electronic health records and e-referral for patients

Section A: **General Overview**

1. What is your position in the hospital? Mark with X

Nurse	Doctor	Other

2. Do you personally record patient information? Yes or No

_____

3. Do you personally transfer patients to other wards/ hospitals? Yes or No

_____

4. Do you share patients' health records with other healthcare practitioners in wards or other hospitals? Yes or No

_____

Section B: **Patient Health Record**

5. What type of ICT system are you currently using for creating patient health records?

_____

6. What type of ICT system are you currently using for maintaining patient health records?

_____

7. Is there a central place/system for creating and maintaining patient health records? Yes or No

_____

8. Are the patient health records stored electronically or handwritten?

_____

9. State the staff responsible for recording patient health records. Mark with X

Doctors	Nurses	Other (Specify)

10. State the standard format for collecting patent information. (e.g. form or minimum fields)

_____

11. What is the average time spent per day for creating and maintaining patient health records?

_____

12. Where are the patients' health records stored? (E.g. records room, storage, filing cabinets)

_____

13. What is the standard format of storage? (Alphabetically, date, numerically)

_____

14. Name the categories of staff that have authorization to access patient health records. Mark with X

Nurses	Doctors	Other(Specify)

15. State the average time spent on record keeping?

Creating	Maintaining	Retrieving

16. Do you think the current patient health record system provides accurate and complete information?

_____

17. Is the quality and format of information effective for sharing between healthcare professionals? Yes or No

_____

18. Does the current patient health record storage process save time? Yes or No

_____

19. Does the current patient health record storage process provide confidentiality? Yes or No

_____

20. State the disadvantages of the current patient health record storage process

Item	**Disadvantage**
Creating patient health record	
Maintaining patient health record	
Storing patient health record	
Retrieving patient health record	

Section B: **Patient Referral**

21. Do you think collecting and recording of patient health records electronically will be beneficial to the hospital for patient referrals? Yes or No

_____

Please state why for the above answer

_____

22. What ICT hardware and software/programs do you currently have at the hospital that can support e-Referrals?

_____

23 .How often do you refer patients to other wards? Mark with X

Daily	Weekly	Monthly	Other(Specify)

24. How often do you refer patients to other hospitals? Mark with X

Daily	Weekly	Monthly	Other(Specify)

25. Is the patient health record information re- created when the patient is referred to another ward or a new hospital? Yes or No

_____

The End - Thank you for your participation

Appendix C

Ethics Approval letter from UNISA

UNISA | college of science, engineering and technology

Mrs Ntsako Fikile Nevhutalu (50876430)
School of Computing
UNISA
Pretoria

2013-05-21

Permission to conduct research project

Ref: 057/NFN/2013

The request for ethical approval for your MTech: (IT) research project entitled "Improving patient referral processes through electronic health record system: A case study of rural hospitals in Limpopo Province" refers.

The College of Science, Engineering and Technology's (CSET) Research and Ethics Committee (CREC) has considered the relevant parts of the studies relating to the abovementioned research project and research methodology and is pleased to inform you that ethical clearance is granted for your study as set out in your proposal and application for ethical clearance.

Therefore, involved parties may also consider ethics approval as granted. However, the permission granted must not be misconstrued as constituting an instruction from the CSET Executive or the CSET CREC that sampled interviewees (if applicable) are compelled to take part in the research project. All interviewees retain their individual right to decide whether to participate or not.

We trust that the research will be undertaken in a manner that is respectful of the rights and integrity of those who volunteer to participate, as stipulated in the UNISA Research Ethics policy. The policy can be found at the following URL:
http://cm.unisa.ac.za/contents/departments/res_policies/docs/ResearchEthicsPolicy_apprvCounc_21Sept07.pdf

Please note that if you subsequently do a follow-up study that requires the use of a different research instrument, you will have to submit an addendum to this application, explaining the purpose of the follow-up study and attach the new instrument along with a comprehensive information document and consent form.

Yours sincerely

Chair: School of Computing Ethics Sub-Committee

University of South Africa
College of Science, Engineering and Technology
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone + 27 12 429 6122 Facsimile + 27 12 429 6848
www.unisa.ac.za/cset

Appendix D

Information Leaflet and Informed Consent

Dear Participant

You are being requested to participate in a research study. We will provide you with the necessary information to assist you to understand the study and explain what would be expected of you (participant). These guidelines would include the risks, benefits, and your rights as a study subject. Please feel free to ask the researcher to clarify anything that is not clear to you. Participants should note that participation in this research study is voluntary.

To participate, it will be required of you to provide a written consent that will include your signature, date and initials to verify that you understand and agree to the conditions. This consent form is indicated below.

You have the right to query concerns regarding the study at any time. Immediately report any new problems during the study to the researcher. The cell phone number of the researcher is provided. Please feel free to call this number.

Furthermore, it is important that you are aware of the fact that the ethical integrity of the study has been approved by the College of Research and Ethics Committee (CREC) of the University. The CREC consists of a group of independent experts that has the responsibility to ensure that the rights and welfare of participants in research are protected and that studies are conducted in an ethical manner. Studies cannot be conducted without the CREC's approval. Queries with regard to your rights as a research subject can be directed to The College of Research and Ethics Committee, College of Science, Engineering and Technology, UNISA, PO Box 392, UNISA, 0003

If you do partake, you have the right to withdraw at any given time during the study without penalty or loss of benefits. Although your identity will at all times remain confidential, the results of the research study may be presented at scientific conferences or in specialist publications.

This informed consent statement has been prepared in compliance with current statutory guidelines.

I understand that by signing this form I am consenting to participate in this study.

Participant's surname and initials…….....

Signature: ……. Date……

Thanking you for your participation.

Yours sincerely

……..

Ntsako Nevhutalu

Researcher

Cell: 0824550105

…….

Dr Alfred Coleman

Supervisor

UNISA

Tel: 0124296395

Cell: 0731370859

Appendix E

Approval letter from Limpopo Department of Health

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF HEALTH

Enquiries: Selamolela Donald Ref:4/2/2

Nevhutalu NF
University of South Africa

Pretoria

Greetings,

Re: Improving patient referral processes through electronic Health Record System: A case study of rural hospital in Limpopo Province

1. The above matter refers.
2. Permission to conduct the above mentioned study is hereby granted.
3. Kindly be informed that:-
    - Further arrangement should be made with the targeted institutions.
    - In the course of your study there should be no action that disrupts the services.
    - After completion of the study, a copy should be submitted to the Department to serve as a resource.
    - The researcher should be prepared to assist in the interpretation and implementation of the study recommendation where possible.

Your cooperation will be highly appreciated.

Head of Department

24/06/2013
Date

Appendix F

Approval letter from Elim Hospital

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF HEALTH
ELIM HOSPITAL

Ref: S5/2/5/1
Enq: Ms Shirinda N.M
Date: 2013-07-02

To: Ms Ntsako Nevhutalu

CC: Nursing Services
CC: Patient Adminstration
CC: Clinical Services

From: Human Resources Utilization and Capacity Development

RE: PERMISSION TO CONDUCT A RESEARCH STUDY AT ELIM HOSPITAL

1. The above matter refers.
2. Receipt of your request for permission to conduct research study is hereby acknowledged.
3. Kindly be advised that there is no objection as the Head of the Department has granted you the opportunity to conduct your study at the institution on the 8th and 9th July 2013.
4. Hope this will be in order.

CHIEF EXECUTIVE OFFICER 2013/07/02 **DATE**

P/Bag X312 Elim Hospital, 0960Tel (015)556 3201/2/3/4/5, Fax (015)556 3160, Email: elimhospital@dhw.norprov.gov.za
The heartland of Southern Africa - development is about people

Appendix G

Approval letter from Donald Fraser Hospital

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DONALD FRASER HOSPITAL

LIMPOPO PROVINCE
DONALD FRASER HOSPITAL
03 JUL 2013
PRIVATE BAG X9302, GIYANI
DEPARTMENT OF HEALTH & SOCIAL DEVELOPMENT

Enquiries: VF Mphephu
Nursing Audit Unit
Tel. No: 0159631778
Extension: 2067

To: Ntsako Nevhutalu (50876430)
School of computing
UNISA
Pretoria

RE: PERMISSION TO DO RESEARCH STUDY AT DONALD FRASER HOSPITAL

The above matter has reference

Kindly be informed that your application to conduct a research study has been granted. You are therefore requested to contact Nursing Administration Office Number 7, OPD basement for logistic arrangements. Please bring along the following documents

- Ethical clearance from the Department of Health
- Permission from your learning institution
- This letter

Hoping that you will find this in order.

Signed.....Date...03/07/2013
CHIEF EXECUTIVE OFFICER

The heartland of Southern Africa – ***development is about people***

Appendix H

Approval letter from Tshilidzini Hospital

TSHILIDZINI HOSPITAL ETHICS COMMITTEE

Memorandum of understanding

Tshilidzini Hospital Ethics Committee with Ntsako Mevhutalu ...at their meeting resolved to sign a Memorandum of Understanding after the two parties have agreed on the following information:

1. Reasons for making a research at Tshilidzini hospital.
To help with the understanding the investigation of the current electronic health record and patient referral process.
2. What will be the benefit of the entire hospital community out of your findings?
The improvement of the current paperbased processes of the proposed and patient referral
3. Who to meet in conducting your research
Administrators, Doctors, nurses or anyone who can assist with ehr record keeping and patient referral
4. What do you do with your findings?
Report back the results to the hospital and propose an EHR and e-referral framework
5. We will require the hard copy of your research
The copy will be provided after completion of the masters
6. We do not anticipate any information to be divulged to all types of media without the knowledge of the Ethics Committee and Hospital Board.

7. Memorandum of understanding should be signed by both parties.

Signed by: NTSAKO MEVHUTALU

13-09-2013
Date:

Researcher

Ndwambi
Nkwana
Rathanye
Tshilidzi

2013-09-13

13/09/2013