

**PERCEPTIONS AND EXPERIENCES OF HEALTH CARE WORKERS ON THE
USE OF ELECTRONIC MEDICAL RECORDS AT TWO HEALTH CENTRES IN
LIVINGSTONE, ZAMBIA.**

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KEY WORDS

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ABSTRACT

Introduction: Health information systems (HIS) have much to offer in managing healthcare costs and in improving the quality of care for patients. However, the adoption of HIS can cause problems to health professionals in terms of efficiency as well as to the entire health organization in terms of acceptability and adaptability. The development of a national Information and Communication Technology (ICT) policy in Zambia was initiated in 2001 through an extensive consultation process which involved academics and civil society organizations. The aim of using ICT is to improve the quality of health service delivery at local levels. Maramba and Mahatma Gandhi Clinics are the largest primary health care (PHC) clinics in Livingstone and have been prioritized for the implementation of an electronic medical record (EMR) system.

The current study explored health care workers' perceptions and experiences of the use of ICT-based EMR and factors that could determine acceptability of EMR at Maramba and Mahatma Gandhi clinics to feed into future program improvement.

Methodology: An exploratory qualitative study design was used. Four focus group discussions were conducted to explore health care workers' perceptions and experiences of the use of ICT-based EMR and factors that could determine acceptability of EMR. The groups comprised clinicians, nurses, counsellors, data entry, pharmacy and laboratory staffs. The data was analysed using thematic content analysis.

Findings: Patient management factors that were reported by health care workers that impacted on the adoption of the electronic medical were: *efficiency in providing patient care; patient waiting times; continuity of care; and patient monitoring*. Data management factors that influenced health care workers to adopt or not adopt the electronic medical record system included *data storage; retrieval of patient information; power cuts/load shedding; loss of smart cards and data errors*. Information Technology factors expressed by the HCW were *lack of network connectivity; antivirus updates and hardware*. Finally, *staff attitudes, shortage of manpower, staff training/orientation, computer literacy; patient records and missing files* were some of the health services/systems factors reported which impacted on the adoption of the electronic medical record system.

Conclusions: Smooth roll-out of EMR in health facilities requires updating of hardware infrastructure such as back-up power supply, network connectivity between computers, internet

connectivity for antivirus updates and adequate supply of computer hardware, as well as addressing human resource challenges through regular health care worker trainings/orientations in EMR, basic computer skills training and increased staffing. Technical problems with EMR such as data errors also need to be addressed.



ABBREVIATIONS AND ACRONYMS


ART	Antiretroviral therapy
EHR	Electronic Health Record
EMR	Electronic Medical Record
EPR	Electronic Patient Record
HIT	Health Information Technology
ICT	Information Communication Technology
IT	Information Technology
LDMO	Livingstone District Medical Office
MCDMCH	Ministry of Community Development Mother Child Health
MoH	Ministry of Health
PMTCT	Prevention of Mother to Child Transmission



DECLARATION

I declare that this thesis entitled “*Perceptions and experiences of health care workers on the use of electronic medical records at two health centres in Livingstone, Zambia*” is my own work. It has not been submitted for any degree or examination in any other university and that all the references I have used or quoted have been acknowledged.

Full Name: Moomba Kaala

Signature: 

Date: 24 May 2017



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The road to this achievement has not been easy. It has had its ups and downs. Nevertheless, it has now come to a conclusive end. First and foremost, I would like to thank God for his guidance and grace as I embarked on this assignment.

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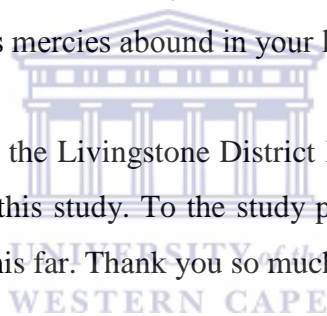


TABLE OF CONTENTS

Keywords	i
Abstract	ii
Abbreviations and acronyms	iv
Declaration	v
Acknowledgements	vi
Chapter One – Introduction	1
1.1 Background	1
1.2 Problem statement	3
1.3 Aim and objectives	3
1.4 Structure of the thesis	3
Chapter Two - Literature Review	5
2.1 Introduction	5
2.2 Introduction of EMR in Zambia	5
2.3 Background and Importance of EMR	5
2.4 Contextual definition of Electronic Medical Records	6
2.5 Reasons and benefits of adoption of Electronic Medical Records	6
2.6 Challenges of Electronic Medical Records	8
2.7 Use of Electronic Medical Records in developed countries	9
2.8 Use of Electronic Medical Records in developing countries	10
2.9 Factors influencing the use of EMR	11
Chapter 3 – Research Methodology	15
3.1 Introduction	15
3.2 Description of the study setting	15
3.3 Study design	15
3.4 Study population	16
3.5 Sampling procedure	16
3.6 Data Collection	16
3.7 Data Analysis	17
3.8 Credibility & Trustworthiness	17
3.9 Ethics Considerations	18
3.10 Summary	19
Chapter 4 – Results	20
4.1 Description of study participants	20

4.2 Summary of themes and sub themes	22
4.3 Patient Management Factors	23
4.3.1 Efficiency in providing patient care	23
4.3.2 Patient waiting times	23
4.3.3 Patient Monitoring	24
4.3.4 Continuity of care	25
4.4 Data Management Factors	26
4.4.1 Data Storage	27
4.4.2 Retrieval of patient information	27
4.4.3 Power cuts/Load shedding	27
4.4.4 Loss and safety of smart cards	28
4.4.5 Data Errors	29
4.5 IT Infrastructure Factors	29
4.5.1 Lack of network connectivity	30
4.5.2 Antivirus updates	30
4.5.3 Hardware	30
4.6 Health Services/Systems Factors	31
4.6.1 Staff attitudes	31
4.6.2 Shortage of manpower	31
4.6.3 Staff training/orientation	31
4.6.4 Computer Literacy	33
4.6.5 Patient Records	33
4.7 Summary	34
Chapter 5 – Discussion	35
5.1 Introduction	35
5.2 Patient Management Factors	35
5.3 Data Management Factors	36
5.4 IT Infrastructure Factors	36
5.5 Health Services/Systems Factors	37
5.6 Limitations of the study	38
Chapter 6 – Conclusions & Recommendations	39
6.1 Conclusions	39
6.2 Recommendations	39
6.2.1 Recommendations regarding data management factors	39



6.2.2 Recommendations regarding data management factors	40
Recommendations regarding IT infrastructure	40
6.2.4 Recommendations regarding health services/system factors	40
References	41
List of Tables	
Table 4.1. Description of participants	21
Table 4.2. Classification of themes and sub-themes	22
Appendices	
Appendix 1. Participant Information Sheet	53
Appendix 2. Focus Group Discussion Guide	55
Appendix 3. Focus group confidentiality binding form	56
Appendix 4: Informed Consent	57
Appendix 5: Demographic Profile	59
Appendix 6: District Clearance	60
Appendix 7: UWC Ethics Clearance	61



CHAPTER ONE – INTRODUCTION

1.1 BACKGROUND

Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (WHO, 2002). Kolodner et al. (2008) suggests that the importance of healthcare to individuals and governments and its growing costs to the economy have contributed to the emergence of healthcare as an important area of research for scholars in business and other disciplines. They further suggest that health information systems (HIS) have much to offer in managing healthcare costs and in improving the quality of care. In addition to the embedded role of information technology (IT) in clinical and diagnostics equipment, HIS are uniquely positioned to capture, store, process and communicate timely information to decision makers for better coordination of healthcare at both the individual and population levels (Kolodner et al., 2008).

It should be noted that healthcare influences the quality of our lives and how we function within the society. Healthcare mistakes have serious consequences that can affect our ability to carry out social and productive endeavours. Reports have shown the gravity of adverse events in hospitals and the dangers such events pose to individuals and the public (Piontek et al., 2010). More generally, medical errors are expensive, increase length of stay of patients in hospital, and cost human lives (Classen et al., 1997). Therefore, healthcare quality should be diligently pursued and vigilantly executed, and information systems can facilitate such pursuit by highlighting and monitoring errors at various stages along the continuum of care.

The importance of implementing and using health information technology (HIT) to improve the delivery of health care has been increasingly recognised (Thompson & Brailer, 2004; Ash & Bates, 2005). The Institute of Medicine (2001) suggests that the automation of clinical, financial and administrative transactions (through HIT) is essential to improving quality, preventing errors, enhancing consumer confidence in the health system and improving efficiency. Driven by the needs to improved efficiency of clinical and administrative processes, and reduce medical errors, healthcare costs, many healthcare institutions are implementing electronic health records (EHR) systems to allow clinical information gathering and access at the point of patient care.

One vital aspect of healthcare delivery which has benefited from Information and Communication Technology (ICT) is the patient record. Patient records are pivotal in

healthcare systems since all clinical decisions and subsequent continuum of care emanate from it. Coiera (2003) suggests that the patient record provides a means of communication between health professionals. Healthcare service delivery cannot exist if there is no patient record. This is because patient records assist health care workers better manage the health of patients. Proper handling of patient record is imperative for the provision of quality and efficient healthcare. This means patient records should be secure, readily available and easy to retrieve for continuity of care. Currently, the two technologies in use for managing patient records are the paper technology and computer assisted patient record. The latter is often termed electronic patient record (EPR) or electronic medical record (EMR).

The introduction of large scale information technology such as EMR will result in changes in the generation, storage and retrieval of patients' records; which will, in turn, impact on the organization of health services (May et al., 2002). However, the introduction of ICT in an organization does not mean it will be used as intended. Users may reject it, misuse it, sabotage it or work around it (Holden & Karsh, 2010). According to Holden and Karsh, it is imperative to engage health care workers who will use the system and those who are currently using the system for successful implementation of the proposed EMR.

One of the significant factors in the planned introduction of IT is the attitudes of the staff that will be required to use it (Bagozzi, 2007). Individual users' acceptance of ICT is a crucial factor in determining the success or failure of an ICT system (Holden & Karsh 2010; Ward et al., 2008). Some studies have found negative attitudes by nurses in the United Kingdom to IT (Timmons, 2003; Ward et al., 2008) and in Taiwan (Lee et al., 2008). As a result, a need was identified for more qualitative research into the factors which influence staff attitudes. Ash and Bates (2005) reported poor usability of EHR user interfaces, clinicians' resistance to EHR acceptance, and patients' reaction to EHR as challenges to implementation.

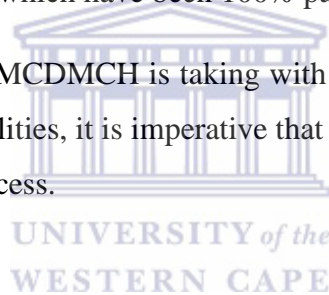
The World Health Organization (WHO) indicated that though ICT in healthcare offers great potential in general, it could be more relevant and beneficial to resource- constrained settings and developing countries (WHO, 2010). With this view, understanding HIT systems requires a focus on the interrelation between technology and its social environment. In other words, a socio-technical approach is required. Sociotechnical approaches favour a central role for the user in the development and implementation process. Successful user involvement also recognizes that technology 'implementation' is first and foremost a process of organizational change (Berg, Aarts & van der Lei, 2003).

1.2 PROBLEM STATEMENT

Maramba and Mahatma Gandhi Clinics have a total catchment population of approximately 30,000 people each. They are the two largest urban clinics or health centres in Livingstone District. Facility records and documentation are approximately 95% paper based.

Currently, the only computer based EMR is used for antiretroviral therapy (ART) services; which include Prevention of Mother to Child Transmission (PMTCT). The data generated from this system is entered by trained data entry clerks or data associates. Other services such as general out-patient department (OPD) services for instance family planning, tuberculosis, mother-child health (MCH) services and many others are completely paper based. Currently, the Ministry of Health (MoH) and Ministry of Community Development Mother Child Health (MCDMCH) have approved certain first, second level hospitals and health centres to be model sites for the implementation of an already designed computer based EMR system called smart care at all service delivery points which have been 100% paper based.

With the direction the MoH and MCDMCH is taking with the implementation of EMR from paper based records in health facilities, it is imperative that views of the users are investigated to inform the implementation process.



1.3 STUDY AIM AND OBJECTIVES

The current study explored health care workers' perceptions and experiences of the use of ICT based EMR and factors that determined their acceptability of the EMR at Maramba and Mahatma Gandhi health centres in Livingstone, Zambia.

The specific objectives of the study were:

- To explore health care workers' perceptions of EMR.
- To explore health care workers' system users' experiences of EMR.
- To explore factors that could determine acceptability of the EMR.

1.4 STRUCTURE OF THESIS

This thesis is divided into five chapters.

Chapter one gives the background to the research study including the study context, research problem, aim and objectives.

Chapter two presents a review of the literature on Implementation of EMR in Zambia, background and importance of EMR, reasons and benefits of adoption of EMR, challenges of EMR, electronic medical records in developed and developing countries including Zambia and finally the adoption and acceptability of the EMR.

The third chapter describes the methodology used in the study and the study setting. This chapter also describes the study design, study population, and the sampling process employed to obtain the study sample, the data collection methods and analysis of data including rigor of the study as well as highlighting ethical issues and limitations.

The fourth chapter presents the findings of the research study.

The fifth chapter outlines the findings.

The final chapter presents conclusions from the study and makes recommendations based on the findings.



CHAPTER TWO - LITERATURE REVIEW

2.1 Introduction

The literature review outlines the following areas: Introduction of EMR in Zambia; background and importance of EMR; contextual definition of EMR; reasons and benefits of adoption of EMR; challenges of EMR application; use of EMR in developed countries; use of EMR in developing countries and sub-Saharan Africa; and factors influencing use/adoption of EMR.

2.2 Introduction of electronic medical records in Zambia

The development of a national ICT policy in Zambia began in 2001, was completed in 2005 and adopted in 2006 through an extensive consultation process which involved academics and civil society organisations (Souter, 2010). The policy established a framework for the future direction of ICTs within Zambia. This policy highlighted five key priority areas which are human capacity development, agriculture, education, health and the development of ICT service (Souter, 2010). In the health sector, the aim of using ICT through EMR implementation was to improve the quality of health of all citizens through reductions in medical errors, increased availability of real-time information and decision support (Sequist et al., 2005).

The Ministry of Community Development Mother and Child Health (MCDMCH) has selected Maramba Health Centre to be one of the pilot sites for an e-first EMR system. Computer hardware has already been deployed to the institution in readiness for implementation. This implies that all points of patient care such as registry, out-patient department, maternal and child health (MCH) unit, family planning, tuberculosis and others will use the same ICT based EMR used in ART and PMTCT to capture data through a local area network though using specific programmatic modules in the EMR.

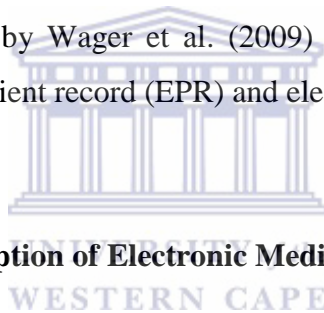
2.3 Background and importance of electronic medical records

The Ministry of Health Zambia is mandated to provide quality health services, promote of equity in access, stewardship and governance of the health sector (NHSP, 2014-2016). To achieve its mandate, there is high need for quality information to guide policy making, interventions and management of health facilities at all levels of health care. Over the years

getting the quality information required for decision making and policy generation has been a challenge. This has partly been due to poor infrastructure (health information), numerous and parallel information systems, with inadequate human resource to support data collection, transformation, presentation and archiving among others (Sumita et al., 2007).

2.4 Contextual definition of Electronic Medical Records

"Medical records" refers to records of medical institutions and professionals engaged in medical work on patients, including records on various inspections, diagnoses and treatment processes (Hwang et al. 2006). The National Alliance for Health Information Technology, 2008 as cited in Wager et al. (2009:111) defines EMR as, "*An electronic record of health-related information on an individual that can be created, gathered, managed and consulted by authorised clinicians and staff within one health care organisation.*" For the purposes of this research, the definition as cited by Wager et al. (2009) will be applied and will be used synonymously with electronic patient record (EPR) and electronic health record (EHR).



2.5 Reasons and benefits of adoption of Electronic Medical Records

Implementation of electronic medical records has become a major priority in the health care due to rising concerns for patient safety, reducing medical errors and improving the provision of evidence-based care which are critical to this study (Doebbeling, Chow & Tierney, 2006). EMR implementation studies have shown potential benefits to patients and care providers where fewer medical errors, more efficient health care delivery, reduced costs, streamlined clinical workflow, better disease management, improved quality, and improved data tracking and accessibility have been outcomes (Hanna et al., 2005). Similarly, Greko (2005) and El-Kareh (2009) reported perceptions of increased quality of care in two longitudinal studies due to EMR implementation. The potential benefits of using electronic medical records (EMR) over paper records in improving the quality of healthcare delivery have been extensively studied (Mekhjian et al., 2002; Pizziferri et al., 2005). While scholars such as Rodriguez (2002), Sood et al. (2008), Peek (2014) and Dimitrovski (2013) have shown superiority of EMR over paper records to improve efficiency in quality of care, DesRoches et al. (2008) raises concerns of physicians being slowed down by EMR software; thereby causing them to be less

efficient. DesRoches also argues that the use of EMR creates additional workload to record data to the system and requires computer skills.

EMR promises rapid access to health information, which arguably leads to improved healthcare outcomes and more efficient use of resources, as stated by the US Institute of Medicine (2001). The Institute of Medicine (2001) report stresses the critical role played by Information technology in achieving patient safety, effectiveness, patient centeredness, timeliness, efficiency and equity of healthcare.

A study in Canada reported that the integration of information communication technology (ICT) in general and electronic medical records (EMR) was an essential component of health care reform (Romanow, 2002). This is because integration would improve health care service delivery. Information and communication technologies (ICT) include a set of effective tools to collect, store, process, and exchange information (Gunton, 1993). There is a common belief that widespread adoption of health information technology (HIT) has the potential to improve health care quality, reduce costs and increase the efficiency of the health care delivery system (IOM, 2001; Hillestad et al., 2005; Blumenthal, 2010). Among the different IT system initiatives in developing countries, electronic medical records (EMR) systems are becoming dominant with the vision of improving data handling and communication in healthcare organizations (Hughes, Bellis & Tocque, 2002). Alvarez (2004) suggests that applications of ICTs to the healthcare sector such as the electronic health record (EHR) are viewed as the backbone supporting the integration of various tools that could improve the uptake of evidence into clinical decisions.

EMRs have been reported to improve quality of care in numerous ways. Some of these are increasing patient safety through reducing medication errors (Tamblyn et al., 2003), efficiency of care through reducing duplicate testing (Mekhjian et al., 2002), effectiveness of care by assisting physicians using clinical decision support systems (Ornstein et al., 1991; Garg et al., 2005), timeliness of care through faster access to clinical information at the point of care (Forsythe et al., 1992) and improving health delivery analysis through more efficient outcome assessment, research, and audit to inform decision making both at the individual practice level and across the health system (Nordyke & Kulikowski, 1998). Chaudhry et al. (2006), Earnest et al. (2004), Hassol et al. (2004) and Ross et al. (2004) all support several benefits of EHRs for patients. These would prevent many medical errors because all the providers involved in a patient's care could receive timely clinical data, accessible and readable by all, and that automated order

entry systems and decision support systems would be able to check for errors and provide evidence-based clinical guidelines to aid health care providers in decision making at the point of care (IOM, 2001).

The Institute of Medicine (1991) suggests that there are many problems associated with paper-based medical records some of which are: storage problems; lost/misfiled charts; ineffective data management and written errors (Al-Farsi & West, 2006). Young et al. (1998) and Maghazil (2004) suggest that records documented by hand can be badly written, inaccurate, incomplete, poorly structured and even lost altogether making it difficult to validate, collect and analyse data to enable decision making and ensure quality of care. Patient records have been stored in paper form for centuries and, over this period they have consumed increasing space and notably delayed access to efficient medical care (Da've, 2004). The reason that a significant number of health care workers prefer the traditional pen and paper method is that it is significantly simpler to utilize versus the existing technology solutions that have been implemented. Boonstra (2010) and Hillestad (2005) suggest that EMR strengthen the health system and clinical care by facilitating legible, organized medical records and access clinical information about individual patients.

Throughout the last decade, health care researchers and policy makers have promoted the use of health information technology, especially electronic health records to transform the delivery of health care (Chaudhry et al., 2006).

2.6 Challenges of Electronic Medical Records

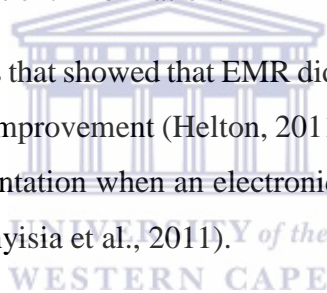
Shortliffe (1998) raises concerns such as confidentiality, privacy and security with regards to EMR. Numerous challenges have been identified with the EMR. These include: computer down time, lack of standards, increased provider time, and threats to confidentiality. Studies conducted in health institutions in the United States of America suggest that electronic order entry increases the amount of time physicians spend entering a prescription (Fiscella & Geiger, 2006; Powner, 2006). Powner reported that physician residents required 44 more minutes per day using computerized order entry, although internal medicine residents using the order entry gained half of that time back in cost savings elsewhere. The research further indicated a high overall rate of user satisfaction of the system.

Compared to other industries, the acceptance of information technology in health care has been slow (Powner, 2000; Carter, 2006); and compounded by the limited experience available in deploying applications, has resulted in a steeper learning curve for health care organizations. A systematic literature review of empirical research on EHR implementation showed that although EHR systems are anticipated as having positive effects on the performance of hospitals, their implementation is a complex undertaking (Boonstra, Versluis & Vos, 2014).

Lober et al. (2008) and Tierney et al. (2002) suggest that unstable electricity provision is one of considerable factors interrupting operation of EMR systems and they propose additional investment on back-up system – uninterruptible power supply.

A study by Graham and Dizikes (2011) suggest that software bugs in the EMR can jumble data, delete information or deposit it in the wrong place. They further suggest that computers hosting the EMR may produce some disorganized data preventing physicians and other health care workers to quickly find critical patient information.

Although there are several sources that showed that EMR did increase efficiency, some showed that there was the opposite or no improvement (Helton, 2011). In some situations, there was an increase in time spent on documentation when an electronic system was introduced (Dastagir et al., 2012; Lau et al., 2012; Munyisia et al., 2011).



2.7 Use of Electronic Medical Records in developed countries

EMRs have been widely used in developed countries such as the United States, United Kingdom and Australia. Avison and Young (2007) suggest that although significant failures still exist in the systems these developed countries have implemented, there is strong support and motivation to accomplish goals associated with comprehensive development of successful medical information technology systems. These countries can make significant investments in research to develop information systems that would meet the need of their healthcare system. This is in sharp contrast to the healthcare infrastructure of many developing countries.

With the introduction of EMR systems, it was widely believed that their broad adoption would lead to major health care savings, reduction of medical errors, and improvement of health; but little progress toward attaining these benefits was evident (Fonkych & Taylor, 2005). The United States trails several other countries in the use of EMR systems, where only 15 –20% of

United States physicians' offices and 20–25% of hospitals have adopted such systems. Fonkych and Taylor (2005) suggest that the barriers to adoption include high costs, lack of certification and standardization, concerns about privacy, and a disconnection between who pays for EMR systems and who profits from them.

2.8 Use of Electronic Medical Records in developing countries

Hillestad (2005) states that despite the high expectations and interest in adopting and using EMR systems worldwide, its overall adoption rate is relatively low, especially in the resource-limited countries where high diseases prevalence and incidence rates are predominant. The implementation of HIT applications in developing countries has been slow, particularly in rural areas (Tomasi et al., 2004; Asah, 2011; Peters, 2006). Some pertinent factors that have been attributed to the slow adoption of EMR in developing countries are; healthcare and technical infrastructures, health professionals' attitude and awareness level, lack of proper management, resource shortage, skill related issues, users' resistance, policy related issues, poor commitments of staffs, and poor maintenance services (Huryk, 2010; Stronge, 1985; Kamadjeu, 2005; Al-Nassar, 2011).

The few projects that used an EMR system fell mainly into two groups: those that used expensive commercial software in specialist projects and private hospitals and those that developed the software usually to manage a specific disease (McGrath et al., 2004). Currently, several effective and successful medical information systems and EMR have been implemented in many developing countries such as South Africa, Kenya and Uganda. Douglas (2003) and Fraser et al. (2004) suggest that although EMR systems have been shown to be feasible in developing countries, the problem of limited resources begs several questions such as the benefits of EMRs to healthcare projects, the practicality of the use of information technology (IT) beyond a few well-funded pilot sites and the beneficial impact on patient care or the management of such healthcare organisations.

Implementing electronic health in developing countries showed significant improvement in ability to track patients, monitor adherence of patients to the treatment regime, and keep track of those who do not follow up their treatments and appointments (Blaya et al., 2010).

Williams and Boren (2008) suggest that EMR systems help developing countries by effectively facilitating data collection, data entry, information retrieval, report generation and research. Real-time application of EMR contributes towards effective clinical decision support through patient monitoring (North et al., 2014) and process automation with the potential to improve the quality of patient care and significantly reduce costs (Rothman et al., 2012).

2.9 Factors influencing the use of electronic medical records

Various studies show that users' attitude, acceptance and skills are critical in the success of EMR system implementation in the healthcare systems since they are the primary users of the system (Mahendra, 2011; Davidson, 2007; Nour EiDin, 2007). In a study conducted in Canada on the adoption of EMR many participants stated lack of awareness of EMR capabilities as an issue that limited EMR adoption (Price, Singer & Kim, 2013). Anderson (1997), Ash et al. (2000) and Rogoski (2003) all suggest that physician acceptance can make or break a clinical information system implementation while Lorenzi and Riley (2000) state that the inability to develop user ownership of clinical information systems such as EMR is the key reason why these systems fail. For some participants, training had occurred when the EMR was implemented, which was several years ago, in some cases, and they had attended little or no subsequent training or user-group sessions. Others joined the clinic after EMR implementation and there were no ongoing training programs: they learned from peers or trial and error. In complex systems like EMRs, this has been shown to lead to unintended consequences—in particular, poor data quality. Some clinics held regular EMR meetings in which practice improvement techniques were shared and this correlated with higher adoption scores. Participants further stated the lack of usability of their EMRs. If users found features that were difficult to use or disruptive to patient care work flow, then those features were often not used or not consistently used.

Other studies conducted found varying EMR usage behaviours with some studies finding high usage (Hogan & Kissam, 2010); while others have found low usage of EMRs by healthcare workers within institutions that implemented EMR systems (Lenhart et al., 2000; Lærum et al., 2001). This variation in usage patterns was attributed to factors such as the quality of the system, the quality of the information it produces (Lærum et al., 2001) and the quality of the service or support that is available for that system (DeLone & McLean, 2003).

Lenhart et al. (2000) conducted a study on EMR use in family practice residencies in the US. They found low usage with 80% of 379 programs reporting never having used EMRs and 3% having discontinued their use; with the major reasons being costs associated with the systems as well as not having the adequate hardware required to run the systems. This is similar to a study conducted by Meade et al. (2001) where lack of basic facilities/hardware needed to support EMR implementation affected the adoption of EMR. Even though 17% of the programs were using EMR, only 2% were completely paperless. The main challenges faced by those that were using EMRs were: time taken to capture data, which perhaps explains why most of them also used paper-based records along with EMR. Time taken to capture data was also one of the reasons given for discontinuing the use of EMR by those who no longer had EMRs. System inadequacy, sponsors deciding against EMR and the loss of financial support were the other reasons given for discontinuing EMR.

A study by Loomis et al. (2002) surveyed members of the Indiana Academy of Family Physicians and found that of the 618 physicians that responded, only (14.4%) had implemented EMR. The users of EMR had a more positive attitude towards EMR systems and their capabilities while non-users saw less of a need for EMR, expressed concerns with regards to data entry, were not as confident in the level of security and confidentiality provided by EMR systems and found the cost of EMR to be too expensive.

Several surveys conducted by researchers have concluded that physicians have insufficient skills and technical knowledge in dealing with EMR, and that this has resulted in resistance (Jha et al., 2009). Physicians and other health care workers require good typing skills to enter patient medical information, notes and prescriptions into the EMR system, and some lack these required skills. In Tanzania, most health care workers are Nurses and Midwives and these groups form 80 per cent of overall healthcare workers. Unfortunately, these workers lack computer skills as well as general skills for the use of E-healthcare information systems. Omary et al. (2010) attributes low adoption of eHealth among developing countries to lack of computer skills amongst the clinicians and other health care workers.

Miller and Sim (2004) report that lack many physicians complain of poor service from the vendor or supplier such as poor follow-up with technical issues and a general lack of training and support for problems associated with the EMRs. Similarly, Ludwick (2009) notes that physicians struggle to get the required technical training and support for the systems from the vendor.

Physicians, other health care professionals and managers' lack of time and workload are important barriers to EMR implementation. Studies involving health care professionals made more general statements about heavy workloads (Greenhalgh et al., 2008) and EMR use as being time-consuming (Chronaki et al., 2007; Randeree, 2007). Many physicians report that using EMRs would take more time for each patient than using paper as, in some situations, it might be more convenient and efficient to use paper records during the clinical encounter (Laerum et al., 2001).

Evidence indicates that health workers' interest, knowledge and skills of computer applications can influence their acceptance or rejection of HIT solutions in the workplace (Kamadjeu, 2005; Moody, 2004). Brumini (2005) suggests that positive attitudes and the willingness of health workers to use any HIT system is influenced by their perceptions of its value, clinical benefits, and ease of use.

Ruxwana (2010), Omary (2010) and Ouma and Herselman (2008) indicate that the successful adoption of HIT in developing countries is hindered by insufficient technical infrastructure. Blank (2013) and Douglas (2010) suggest that where this is due to the non-existence or lack of reliable electricity, solar power can offer an alternative. Adverse attitudes coupled with inadequate computer knowledge and skills among healthcare workers can also negatively impact on the adoption of computer systems such as EMR (Asah, 2011).

Implementation of a computer system in the health care setting in rural India is said to have increased patient visits leading to increased workload which impacted negatively on the health workers' attitudes (Peters, 2006; Mohammed et al., 2013). Rural health workers limited exposure to computer applications in developing countries coupled with the lack of IT infrastructure and support, are very often unsure about the adoption of computers in their workplace (Asah, 2011). Furthermore, inadequate training and support coupled with limited computer access are some of the well-known reasons for the negative attitudes among health care workers (Mohammed et al., 2013).

E-Health infrastructure pertinently affects adoption and acceptability of eHealth (Ouma & Herselman, 2008; Qureshi et al., 2013). Computer infrastructure is the pillar to e-healthcare services implementation. Sufficient quantity of hardware is required to use the EMR systems. Lack of these 'basic' facilities/hardware hinders the adoption of EMR system as this is a requirement to support EMR implementation (Vishwanath & Scamurra, 2007). Therefore, since setting up EMR systems will require more resources the start-up costs will be higher and

therefore, only a few researchers directly refer to the unavailability problem of computers/hardware. In a study conducted by Ouma and Herselman (2008), it is indicated that cost of computers and lack of computers hinder adoption of eHealth amongst hospitals in the rural areas.

Menachemi, Langley and Brooks (2007) suggest that interconnectivity problems are a major obstacle to the wide adoption of EMR system. Interconnectivity enables users to get the best out of the EMR from other inter-linked hardware.



CHAPTER THREE – RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter describes the methodology used in the study. It details the study setting, study design, study population and sampling procedures used. It further describes the data collection procedure, which includes the research tools and the methods of data collection. It further describes the data analysis procedures. Finally, this chapter addresses the issues of rigor, ethics, and the limitations of the methodology used.

3.2 DESCRIPTION OF STUDY SETTINGS

The study was conducted in the Livingstone district of the central province in Zambia. Livingstone district is one of the sixteen districts in Southern province of Zambia. The district has 21 health centres and 1 central hospital. The district has 22 health facilities; which includes Livingstone Central Hospital which is the biggest referral hospital in the province . Maramba and Mahatma Gandhi health centres are the largest primary health care facilities with catchment populations of approximately 30,000 people. The two facilities mainly offer primary health care services such as prevention of mother to child transmission, tuberculosis diagnosis and treatment services, male circumcision, family planning, laboratory services, voluntary counselling and testing, provider initiated testing and counselling, pharmaceutical services and many other services.

3.3 STUDY DESIGN

This was an exploratory study using qualitative research methods. This design employed qualitative methods to gain familiarity with the perceptions and experiences on the use of EMRs at the two largest health centres in Livingstone. Qualitative research approach is aimed at understanding a phenomenon from the view point of the participants in relation to a specific social and institutional context (Robson, 2011; Stoop & Berg, 2003). In other words, qualitative research typically involves systematic and detailed study of individuals in natural settings, instead of in settings contrived by the researcher, often using open-ended interviews intended

to elicit detailed, in-depth accounts of the interviewee's experiences and perspectives on specific issues, situations or events (Kaplan & Maxwell, 2005).

3.4 STUDY POPULATION

The study population comprised HCWs providing services at the two facilities. The healthcare providers included nurses (general and midwives), clinical/paramedical personnel, pharmacy staff, registry clerks, adherence counsellors and data entry clerks. Participants were approached by the researcher to participate in the study.

3.5 SAMPLING PROCEDURE

Aluwihare-Samaranayake (2012) suggests that sampling strategies in qualitative research are designed to produce information-rich cases that yield in-depth understanding of all aspects of the phenomenon under investigation. Therefore, purposive sampling with clustering of staffs from different service delivery points was used to select the participants to ensure that all service areas where staffs will be expected to use the system are covered. Some of these service areas are out-patient department, antiretroviral therapy, Prevention of Mother to Child Transmission, registry, pharmacy and many more. The sample size was 24 health care workers of which each health facility had twelve (12) participants.

Participation in this study was voluntary. In a case where a participant refused to participate, they were excused. The entire research process ensured that there was no disruption of routine activities at the at the health facility because of this research.

3.6 DATA COLLECTION

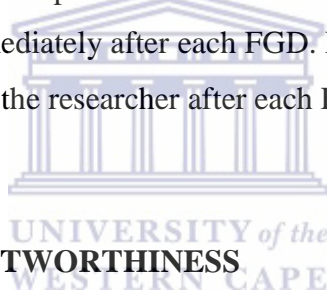
The data collection method employed was focus group discussion (FGD). These were conducted in the conference room of the health centre. They were conducted by the researcher in English. Rules of FGD were explained to members before each discussion and confidentiality of information guaranteed. A FGD guide (Appendix 2) was used. The schedule was informed by instruments used in published studies on the subject under study. The guide included open-ended questions and several associated prompts probing for more detailed

information. Basic demographic data was recorded, together with exploration on perception and experiences with respect to electronic medical records (EMRs).

Four focus groups with 6 participants each were conducted. Two FGD were conducted for those trained or oriented in the use of the EMR and another two for those not trained or oriented.

3.7 DATA ANALYSIS

After data collection, notes taken during the discussion process were read and the audio recording of the discussions listened to repeatedly. The FGD were transcribed in full, analysed and interpreted using thematic content analysis. Six steps detailed by Patton (2002) were used in this process. The six steps are: organisation and preparation of data, reading through the data to get a general sense of the meaning, coding, generating of themes, representation of themes and interpretation. Rich, thick descriptions will be used to convey findings and to bolster validity. Data was processed immediately after each FGD. Field notes also formed part of the data. These notes will be done by the researcher after each FGD.



3.8 CREDIBILITY AND TRUSTWORTHINESS

Qualitative researchers utilize various validation strategies to make studies rigorous, namely checks for enhancing credibility and trustworthiness (Creswell & Miller, 2000).

Credibility was obtained through triangulation of data sources and data collection methods. Triangulation between the data from the FGDs and researcher field notes enhanced credibility through convergence in the data. Convergence in the data was also sought using the sampling and eligibility criteria for participant selection for both the FGD. Similarly, the convergence of the data with the literature further enhanced credibility of the data. Furthermore, similar questions were asked to all FGD participants to ensure uniformity across all groups. The FGD process was explained to participants clearly and discussions were transcribed verbatim. To further ensure credibility, the coding process involved another person (supervisor) which was a validation process of the coding process (findings).

Trustworthiness was achieved by developing an FGD guide that was grounded in the literature. All FGD were conducted in English which is the first language which all health care workers understand.

3.9 ETHICS CONSIDERATIONS

Stommel and Wills (2004) suggest that ethics deals with issues of morality and of the human ability to decide what is right and what is wrong. In this study, ethics were considered right from the beginning to the preparation of the final report. The three primary principles that are articulated in the Belmont Report which constitute a standard for the ethical conduct of research were considered. These principles are: beneficence, respect for human dignity and justice.

The principle of beneficence imposes a duty on researchers to minimize risks and to maximize benefits for the respondents (Polit & Beck, 2008). No degree of harm was generated by this study because of its low sensitive nature and assurance of confidentiality. None of the questions included any kind of allusion to any matter that might induce any kind of negative emotion or psychological trauma. No risk was associated with this research during the data collection process and the results obtained from this study might be useful for addressing problems associated with the implementation of EMR in Livingstone and other districts.

The second principle addressed in this study was respect for human dignity which includes a right to self-determination and the right of the participant to full disclosure of the facts (Polit & Beck, 2008). Self-determination in this context meant that all those who participated in the study had an absolute right to decide whether they wanted or did not want to participate without the possibility of being disadvantaged in any way if they decide not to participate. Thus, all participants in this study were included only if they were prepared to give their informed written consent in the knowledge that they will have the right to withdraw from the study at any time and without the need for any explanation or justification. An informed consent form had to be completed by all participants before the FGD started (Appendix 4). Participants were also given full information about the study through the participant information sheet (Appendix 1).

The protocol was submitted to the University of Western Cape research ethics committee for approval. Further approval was requested from the Livingstone District Medical Office.

Justice implies that respondents have fair treatment and that the information that they impart for research needs to be kept completely private (Polit & Beck, 2008). To obtain an unbiased sample, the researcher selected participants in accordance with the department they work. This meant that there was no bias or unfairness in the researcher's selection of the respondents who participated in the in the FGD. Katzenellenbogen and Joubert (2007) suggest that researchers are obliged for ethical reasons to protect the identity of study participants. To achieve this, all the data was collected in a private room. During the data collection process, the privacy of the participants was maintained because the notes that were taken had no means of identifying the respondent. An assurance that the confidentiality and anonymity of each respondent will be maintained was included in the written information contained in the informed consent form.

3.10 SUMMARY

The goal of this chapter was to describe the methods that were applied in this study to identify the study population. FGDs were used to collect data with high consideration of research ethics and how the credibility and trustworthiness of the study could be achieved. The collected data was analysed using thematic-content analysis. The next chapter details the findings of this study under patient management factors, data management factors, IT infrastructure factors, and health services/system factors themes.

CHAPTER 4 – RESULTS

In this chapter I present a description of participants and an outline of the study results. The main themes that emerged from analysis of interviews with health care workers were i) patient management factors, ii) data management factors, iii) IT infrastructure factors, and iv) health services/system factors.

4.1 DESCRIPTION OF PARTICIPANTS

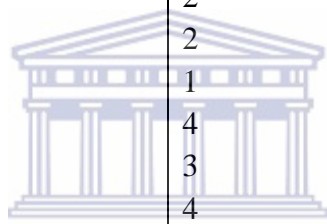
A total of 24 health care workers participated in the FGD; 12 participants were female and 12 were male. Twelve (12) of these participants were experienced with the EMR whilst the other 12 were not. Out of the 24 participants, 11 were from Maramba clinic (MAR) while 13 were from Mahatma Gandhi clinic (MG).

The health care workers ranged from midwives (2), Community Liaison Officer (2), Data Associate (4), Registry clerks (2), Laboratory technologists (2), Pharmacy technologist (1), Adherence counsellors (4), Clinical Officers (3) and general nurses (4).

A data associate is a health care worker responsible for data entry into the EMR at a health facility while a community liaison officer is a health care worker who acts as a link between the health facility and the community within the health facility catchment area for implementation of community activities.

Table 4.1: Description of Participants

	Frequency (N=24)
<u>Sex</u>	
Female	12
Male	12
<u>Use of EMR</u>	
Yes	12
No	12
<u>Health Facility</u>	
Maramba	11
Mahatma Gandhi	13
<u>Staff titles</u>	
Nurse (Midwife)	2
Community Liaison Officer	2
Data Associate	4
Registry Clerk	2
Laboratory Technologist	2
Pharmacy Technologist	1
Adherence Counsellor	4
Clinical Officer	3
Nurse	4



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4.2 SUMMARY OF THEMES AND SUB-THEMES

The perceptions and experiences of health care workers on the use of electronic medical records at the two largest health centres in Livingstone are outlined below in table 4.2.

Table 4.2: Classification of themes and sub-themes

THEMES	SUB THEMES
Patient management factors	Efficiency in providing patient care
	Patient waiting times
	Continuity of care
	Patient monitoring
Data management factors	Data storage
	Retrieval of patient information
	Power cuts/Load shedding
	Loss of smart cards
	Data errors
IT infrastructure factors	Lack of network connectivity
	Antivirus updates
	Hardware
Health services/system factors	Staff attitude
	Shortage of manpower
	Staff training/orientation
	Computer literacy
	Patient records
	Missing files

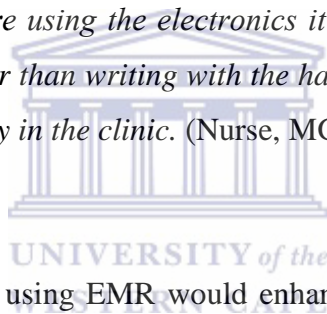
4.3 PATIENT MANAGEMENT FACTORS

Patient management factors refer to a description of the interaction between the patient and the health care team, from intake to discharge. This study found that patient management factors such as efficiency in providing patient care, patient waiting times, continuity of care and patient monitoring impacted on the use and implementation of EMR.

4.3.1 Efficiency in providing patient care

Some participants felt that the use of EMR would enhance health workers' productivity because it would eliminate the use of paper records which hampers service delivery. It would also enhance patient care considering that the patients will spend less time in the health facility.

For me I think it will affect me positively and also the patients because when you look at the time the patient will spend it will be little. We will have less work of writing manually at least if we are using the electronics it's easier you just click everything opens you enter its quicker than writing with the hands so that will lessen the number of minutes the patients stay in the clinic. (Nurse, MG)



While most participants felt that using EMR would enhance patient care, others felt that it would increase their workload. This was because they had to attend to the patient in the clinicians' room, write in the patient record or file and finally enter the same information in the EMR.

For me my first impression was I was impressed like the use of smart care cards, I was impressed that it was going to be good the only problem I was thinking again was too much work as like when the patient comes in the screening room, I have to screen and put the data in the file and then I have to also enter the data in the computer which became like I have to see two people at the same time. (Clinical Officer, MAR)

4.3.2 Patient waiting times

Some participants felt that using EMR reduced patient waiting times especially for out-patients who were in the habit of losing their paper card numbers causing a delay when searching for their record.

Positively, just as she is saying you find that of late OPD is so packed, when a patient comes in the morning usually if one came at 08am they can go back lunch so this will lessen the time spent again those cards some people will lose those cards, it will be easier for us if they lose those cards it will be easier for us to trace the info you will be able to know the reason why they have come back. (Nurse, MG)

Another participant felt the EMR would reduce waiting times because once the patient entered the facility and their record is entered in the EMR, it will reflect at all other service points the patient is scheduled to pass through on that day.

I think for it will bring efficiency. Patients won't stay longer in the facility because the moment the patient comes he will be entered into the system and the system will reflect to say from the registry to the clinical officers room then the clinical officer will just shout out patient number then the patient comes in does the screening immediately the pop up will be in the pharmacy where that patient will be required to collect medication if that patient will be referred to do examinations then the pop up will appear in the lab after they have to send the information back to the clinical officer to make prescription? (Clinical Officer, MG)

4.3.3 Patient monitoring

Most participants felt that the EMR would enhance clinical monitoring of patients. If a patient forgets what regimen they are on or if a patient record goes missing in the registry, it can easily be traced and the patient's medication history tracked. Some participants also felt that monitoring of CD4 counts for ART patients could easily be done using EMR.

It's easier to trace like for instance if a patient forgets what kinds of medicine they are drinking, it's easier to just go back and check in the system rather than going to look for his file which sometimes we find gets lost in the registry it's easier just to go there and check his medication or if you want to check at random their CD4 trend you can check how the CD4 has been raising and falling as opposed to files. (Nurse, MG)

Some participants also stated that besides patient monitoring, EMR could also be used for clinic or facility monitoring. Clinic or facility monitoring is reviewing performance of the clinic or health facility through reports generated by the EMR.

We use the information for patient monitoring and as well as clinic monitoring, we can do reports for instance how many patients collected which drug. (Clinical Officer, MAR)

While feeling that the EMR would aid in enhancing patient clinical monitoring, some participants working in departments like laboratory felt it was a burden because they still needed to use both the paper based system and the EMR.

I thought it would be the easiest way to trace the patients record even the results especially that we used to face the challenge of results go missing but on the negative side, unlike what she said, like the data its completely electronic but for other departments like lab, maybe even clinicians we have not yet done away with hard copy so smart care (EMR) was like increasing the burden because the same information we have to enter it in the smart care and in the books we are doing it. (Laboratory Technologist, MAR)

4.3.4 Continuity of care

Most participants agreed that the use of EMR had potential to enhance continuity of care. Some participants who had not used EMR felt that there had been a lot of breaks in patient care due to the loss of paper cards with record numbers by patients thereby making it difficult to trace their physical paper record.

Like maybe still under continuity of care like for OPD like when they come here they have lost the card at home when they come they will open another one so now if everything will be electronic you want the same data you just click and you find it. Since it will be linked you don't have to go, like pharmacy they don't have to go back to the

clinician to inquire they will just check what he has written in the system and do that.
(Nurse, MG)

Participants who had used the EMR stated that it had enhanced continuity of care because patients could access their ART medication from any other clinic within or outside town.

The benefit also like to the patient, they can access like in the case of ART they are able to access drugs even when they are not at the local clinic where they collect drugs so that is very beneficial and some patients have actually confessed that they like it very much because maybe when they were out of Livingstone they were able to collect drugs even when they did not have papers with them. (Nurse, MAR)

I think for because there is an issue of use of smart cards I feel patient records are being easily kept and since they are on the card they are mobile so it means the person will have their records wherever they go as long as there is smart care there and power people will be able to relate to their previous histories depending on what they go there for. (Community Liaison Officer, MG)

Some participants also stressed the fact that once a patient comes into the health facility a health care worker could continue managing the patient because the EMR could give access to the patient's previous medical record.

We talked about the issue of continuity of care, you are able to see where you ended from last time so you can start from there that will help, we talked about time consumption, it will be reduced meaning they will end up spending less time here when they come and be able to go back in good time. (Nurse-midwife, MG)

4.4 DATA MANAGEMENT FACTORS

Data management factors in this research refer to aspects that influence patient records such as storage, retrieval of patient information, power cuts, loss of smart cards and data errors.

4.4.1 Data Storage

Most participants expressed satisfaction with the ability of the EMR to securely store patient records which could be retrieved within the shortest period of time when need arose as compared to the current paper based system where patient records are at times lost due to congestion and overcrowding of the registry.

With me I was also impressed because we used to find difficulties maybe let's say the files are not seen or are lost due to congestion and overcrowding of the registry so with the computer we just go direct in the computer we search the name of the person then we are able to see when this person came and if they have defaulted and if they are following their appointments corrects. (Data Associate, MAR)

4.4.2 Retrieval of patient information

Participants in all FGD reported the ease with which they were able to retrieve patient information using the EMR.

As for me the impression that I have had so far is good in a way because I'm finding to be in a case where everything has been properly documented it is faster when you want certain data as long as it was well updated if you want info on a certain client you can easily find it for me I feel it makes work easier you want a certain information you just click you find it there on the system unlike you go to look for a file you look for a register maybe you cannot find the register but once you have everything as long as it has been entered of course you do have a few cases where by do not find info if it was not updated on the system there are of course compared to the majority those are quite a few but mostly whatever information you want you can find it. (Nurse, MG)

4.4.3 Power cuts/Load shedding

Power cuts/load shedding has been introduced in Zambia due to low water levels available for generation of hydro-power. This has led to power rationing in each geographical area at different times for a six-hour period. Most participants in the FGD were concerned about the success of the EMR considering the current power challenges. With the load-shedding or power cuts, the need for back-up power supply was a major point of discussion by all participants in the FGD and attributed the data entry backlogs within the facilities to power cuts.

Number one, power load shedding issue. The EMR requires power isn't it? It will mean, unless the load shedding problem is rectified by gensets or something like that it will mean that the time when you have no power the what (EMR) will not be updated. (Nurse Midwife, MG)

I think since the country is also experiencing the load shedding issue we need a backup system like genset, solar panel so that there is continuity of work. (Nurse, MG).

Mainly it's the issue of power, load shedding that leads to a lot of backlog you know in that period when power goes they cannot enter at a go when power comes they will have a huge backlog meaning over working them and electronic is supposed to lessen work that's one barrier they are experiencing right now. (Nurse, MG)

4.4.4 Loss and safety of smart cards

Most participants were concerned about the safety of the smart cards which will be given to patients or clients during the implementation of the EMR. These are small bank like cards with a microchip that are used to store patient information. Some participants feared these will be lost while others felt the cards may not be stored correctly by patients.

I think there is need of telling them just like sometimes like the way we educate the community about something there is need to tell them about it then they can disseminate the information to others so even the smart cards they know how to keep them. (Nurse, MG).

The other departments like OPD where it is not very active at the moment, most of the clients we have in OPD easily lose their cards but if it even that side we are using the smart care system it can be very easy for us to trace their history because we have it in the system because there is someone maybe can be treated for STIs for the third time others they won't mention this is the third time but if you have the information you will be able to tell if there is resistance and you will be able to help the client. (Clinical Officer, MAR)

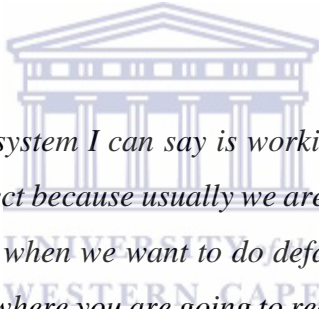
4.4.5 Data Errors

Some participants stated that some reports generated from the EMR have errors and therefore could not be relied upon.

And then we have programing errors in smart care each version comes with different errors. (Data Associate, MAR)

Sometimes the system gives wrong data like for you request appointments for a particular day they will give wrong appointments which are not even for that day. (Laboratory Technologist, MG)

Participants reported that they were generally satisfied with the EMR despite isolated cases of errors being generated when listing clients who were late for medication refill. This forced them to generate paper based registers to have an accurate list.



I think for me smart care system I can say is working out well except that maybe you cannot say it is 100% perfect because usually we are told maybe it is not up to date that why even most of the time when we want to do defaulter tracing exercise you have to get another exercise book where you are going to record when a patient is coming back next using the pharmacy sheet so in one way or another it's quite perfect its working well but maybe not 100% because usually we are told by data people that it's not up to date and the report has an error. (Community Liaison Officer, MG)

4.5 IT INFRASTRUCTURE FACTORS

IT infrastructure factors in this case refers to information technology factors that have a direct bearing on the implementation of the EMR. This refers to local area network (LAN) connectivity, computer software such as antivirus programs and computer hardware such personal computers or laptops.

4.5.1 Lack of network connectivity

The non-interlinking of the computers on a local area network was a major concern for most participants. Currently, the computers in all service departments are stand alone and not linked through a server to enable all service areas to access patient information in real time. A data associate is responsible for merging data from all service points and running these back-ups on all computers at various service delivery points.

I'm thinking if we have a network and all the various points are connected to one server, everyone will find it easy to find all the patients in the database and that way you won't be running to data and back to the file. (Data Associate, MAR)

4.5.2 Antivirus updates

Participants were concerned about the irregular updating of security on the computers housing the EMR. Antivirus updates were erratic thereby posing a danger of losing patient records

The computer experts should be checking on them you put the antivirus so that computer is not affected by viruses so that it's faster. (Nurse, MG)

We also need a system whereby a way we will be cleaning those computers in terms of antivirus. (Data Associate, MAR)

4.5.3 Hardware

Most participants were worried about the turnaround time taken to repair or replace computer hardware once something went wrong thereby posing a threat of losing all information.

Also looking at length of time for something for them to come it takes time what guarantee do we have that those computers they bring first if anything goes wrong maybe it stops working they will repair fast and bring them fast. (Nurse, MG)

So another challenge will be if the computer happens to crush we will lose the data and it will be difficult to trace the client since we will not have hard copies. (Nurse, MG)

4.6 HEALTH SERVICES/SYSTEM FACTORS

Health services/systems factors in this case refers to activities ranging from health services provided, human resource, human resource attitude and human resource capacity building. The

study found that *staff attitude, shortage of manpower, staff training/orientation, computer literacy and patient records* impacted on the successful implementation of the EMR.

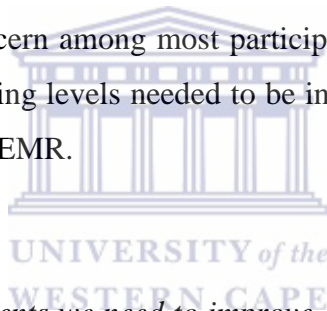
4.6.1 Staff attitudes

Staff attitudes were mentioned as one key pillar to successful implementation of the EMR. Most participants felt that negative attitudes of staff towards the EMR would impede successful implementation.

The gaps are staff attitude in entering data across the board, and let's say implementing smart care not really putting all their full efforts into making smart care work. (Data Associate, MAR).

4.6.2 Shortage of manpower

Staffing levels were a major concern among most participants on the implementation of the EMR. Most participants felt staffing levels needed to be increased in certain departments for successful implementation of the EMR.



I think in certain departments we need to improve on the staffing, OPD okay I would say all departments because if there is a shortfall of staff I don't see it working well somebody cannot sit on the computer and start entering and seeing patients. (Community Liaison Officer, MG).

For me I think it's the staffing like if you go to registry sometimes there is one person and there is a big pile of files you find he cannot manage to update everything within the required time. Community Liaison Officer, MG)

4.6.3 Staff training/orientation

Most participants felt their orientation/training in the EMR was not adequate. They expressed the need for formal trainings in the EMR where they could be trained comprehensively in the whole module rather than just the specific component one will be handling.

Like for me and don't know if that was an orientation I had never used smart care before where someone told me that when you open the file, the information in the smart care is the same as the information in the file so you just enter like that so I don't know what that one was. (Clinical Officer, MAR)

Almost what she was explaining even with me it was not even a day, few hours just to be enrolled in the system then I was told MCH you should go like this, when you do this you do this just like that. (Nurse Midwife, MAR)

To amplify on what she is saying it would be better for a training to go in such a way that the person being trained is made to understand wholly the performance of smart care and not just being told here is a form this is what you enter like what was said earlier on. The person should understand that behind there is something being generated and at the end of the day whatever you do is otherwise it will mean the information produced will be based on the information I was inputting. So we should really ensure that at first people made to really really understand the idea of the EMR. (Data Associate, MG)

Most participants emphasized the need for refresher trainings and orientations on EMR system upgrades.

I think like it was said earlier emphasis on orientations and refresher trainings. There times when new things are brought onto smart care but it's like people are not re-oriented in new things that come and that could also cause a gap. (Data Associate, MG)

4.6.4 Computer literacy

Most participants were concerned about the EMR implementation due to lack of basic computer skills by most health care workers.

And also unlike people from say data that are particularly trained and conversant with using the laptop there are other departments that would have huge challenges into wanting to adapt something new I think a lot of emphasis must be put on that cause not everyone would acclimatize to a certain system faster cause others they only see a computer like that the only thing they can do is play music and watch a movie and charge a phone and end there and play games but when it comes to something a bit more complex I think it will need a little of training, thorough training. (Registry Clerk, MG)

Some participants felt that implementation of the EMR through trainings and orientation was rushed before basic computer skills could be imparted to the users.

I think for me I look at a lot things being over looked. I think we have rushed so much into just orienting or training people into smart care but we have overlooked giving a basic understanding of the computer before entering into the use of the system so in that proposal I would recommend that first we deal with basics of how a computer operates so that it would be easy for people to pick it up from there. (Data Associate, MG).

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4.6.5 Patient records

Most participants felt that the use of the EMR would reduce the loss of patient records which are currently hard copy folders used to store patient information in the registry.

It might change for the better in that sometimes files are missing maybe files, this backlog thing you don't have files you must look for them probably that system will help in that everything will be there you just have to press and you see the client and everything is entered. (Adherence Counsellor, MG)

4.7 SUMMARY

The study results indicated that patient management factors, data management factors, IT Infrastructure and Health services/system factors particularly efficiency in providing patient care, patient monitoring, patient waiting times, power cuts/load shedding, lack of network connectivity, staff attitude, shortage of manpower, staff training/orientation and computer

literacy represented the major concerns in EMR implementation and use. However, if EMR system is to be fully utilized and implemented, the factors outlined above need to be addressed comprehensively.



CHAPTER 5 – DISCUSSION

5.1 INTRODUCTION

The purpose of this research study was to explore health care workers' perceptions and experiences of the use of ICT based EMR and factors that could determine acceptability of the EMR at Maramba and Mahatma Gandhi health centres in Livingstone, Zambia. As outlined earlier in Chapter three, the objectives of the study were to: 1) explore health care workers' perceptions of EMR, 2) explore health care workers' system users' experiences of EMR and 3) explore factors that could determine acceptability of the EMR at Maramba and Mahatma Gandhi health centres in Livingstone, Zambia.

5.2 PATIENT MANAGEMENT FACTORS

Patient management factors included efficiency in providing patient care, patient waiting times, continuity of care and patient monitoring. The findings of this study show consistency with the findings of Greco et al. (2005) and El-Kareh et al. (2009) where there were reports of increased quality of care in two longitudinal studies due to EMR implementation. Most participants felt that the EMR would increase efficiency in providing patient care by reducing patient waiting times. This is similar to various studies which have shown that an EMR system is important to improve the efficiency and effectiveness of healthcare institutions (Sood et al., 2008; Peek, 2014; Dimitrovski, 2013). While other participants felt the EMR would increase efficiency in providing patient care, some still felt it would reduce their efficiency. This is similar to that reported by DesRoches et al. (2008) where physicians felt the EMR rather than paper records would slow them down and would cause them to be less efficient. Some participants felt that the EMR would enhance patient monitoring. This is similar to the findings by Blaya et al. (2010), who reported significant improvement in ability to track patients, monitor adherence of patients to the treatment regime, and keep track of those who do not follow up their treatments and appointments.

5.3 DATA MANAGEMENT FACTORS

Data management factors included data storage, retrieval of patient information, power cuts/load shedding, loss of smart cards and data errors.

Most participants expressed satisfaction with the ability of the EMR to store large amounts of patient data compared to the paper based system while others appreciated the EMR for its quick and easy ability to retrieve patient information. They however expressed displeasure at the huge number of missing or misplaced patient records using the paper system. This finding is in tandem with that reported by Al-Farsi and West (2006) where they found storage problems, lost/misfiled charts, ineffective data management and written errors using the paper based record system. Like this study, Young et al. (1998) and Maghazil (2004) suggest that records documented by hand can be lost altogether making it difficult to validate, collect and analyse data to enable decision making and ensure quality of care.

Most participants expressed satisfaction with the ability of the EMR to easily retrieve patient information. This is similar to the report by Williams and Boren (2008) where it was found that EMR systems effectively facilitate data collection, data entry, information retrieval, report generation and research.

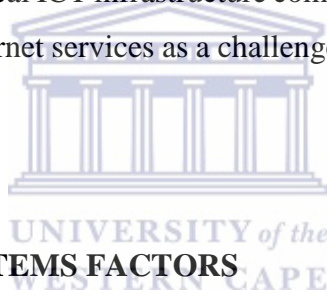
Consistent power supply and power supply back up were noted to be key to the successful implementation of the EMR by most participants. This was because power outages created enormous amounts of patient data entry backlog. The finding is similar to that of Lober et al. (2008) and Tierney et al. (2002), who reported unstable electricity provision as one of factors interrupting operations of EMR. They proposed additional investment in back-up power systems for smooth EMR implementation.

Some participants were concerned about the quality of some reports produced by the EMR which were not accurate. This is like the report by Graham and Dizikes (2011) where it was reported that software bugs may jumble data, delete information or deposit it in the wrong place.

5.4 INFORMATION TECHNOLOGY INFRASTRUCTURE

Some health care workers reported lack of connectivity, antivirus updates and hardware to be a challenge to the adoption of EMR. This is in tandem with the findings of Kamadjeu et al.

(2005), Al-Nassar et al. (2011) and Peek et al. (2014), where they reported poor maintenance services as a barrier to adoption of EMR. The use of EMR requires a sufficient quantity of hardware in practices, in this case computers, local area network and internet connections. The finding in this study showing lack of adequate hardware to operate the EMR is like that reported by Lenhart et al. (2000), where low usage of the EMR was attributed to inadequate hardware. Meade et al. (2009) also reported lack of basic hardware needed to support EMR implementation. Maintenance of computer hardware through antivirus updates and repair turnaround time were a major concern to health care workers. The findings are like those established by Jayasuriya (1995), Osunlaja and Olabode (1997) and Azubuike and Ehiri (1999), who stated the inability of developing countries to draw up maintenance plans to sustain the few computers and other equipment donated by philanthropists due to lack of funds. The lack of connectivity between hardware at different service delivery points was found to be a major obstacle in the implementation of the EMR. This is similar to the report by Anwar and Shamim (2011), who cited inadequate critical ICT infrastructure components such as wired and wireless communication channels and Internet services as a challenge to the implementation of EMR in developing countries.



5.5 HEALTH SERVICES/SYSTEMS FACTORS

Health services/systems factors found to impact on the successful implementation of the EMR were staff attitudes, shortage of manpower, staff training/orientation, computer literacy and patient records.

This study found that staff attitudes towards EMR implementation are very critical for its successful roll out. Negative attitudes were found to impede implementation while positive attitude was noted to foster implementation. The finding is similar to studies conducted by Mahendra (2011), Davidson (2007) and Nour EiDin (2007) where it was reported that users' attitudes, acceptance and skills are critical in the success of EMR system implementation in the healthcare systems since they are the primary users of the system. Similar to this study, Anderson (1997), Ash et al. (2000) and Rogoski (2003) all suggest that physician acceptance is critical to clinical information system implementation such as EMR.

Health care worker training or orientation in EMR emerged as a prominent factor on the success or failure of the implementation of EMR. This finding is similar to that of Miller and Sim

(2004), who reported complaints from physicians of poor service from the vendor or supplier related to technical issues and a general lack of training and support for problems associated with the EMR. Ludwick et al. (2009) also note that physicians struggle to get the required technical training and support for the EMR systems from the vendor or supplier. Health care workers are not technical experts and EMR systems may be perceived as complicated; therefore, health care workers may need proper technical training and support, or may be reluctant to use EMR without it.

Several surveys conducted by researchers have concluded that physicians have insufficient skills and technical knowledge in dealing with EMR, and that this has resulted in resistance (Jha et al., 2009). Omary et al. (2010) attributes low adoption of eHealth among developing countries to lack of computer skills amongst the clinicians and other health care workers. This is like the findings in this study where computer literacy or skills among health care workers impacted on the implementation of EMR.

The loss of patient records was a major concern among participants who felt that EMR would assist to resolve this challenge. This finding concurs with those of Rodriguez et al. (2002) who reported high loss of paper based records in health facilities.



5.6 LIMITATIONS OF THE STUDY

Despite measures in place to ensure trustworthiness and representativeness of the study, the findings of the study were limited in several ways. Possibilities of getting biased responses from participants were likely, considering that the system is highly endorsed by the MoH who was their employer. Participants were however re-assured of confidentiality during the entire process.

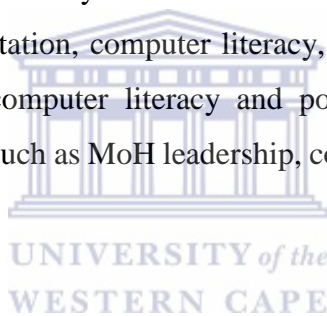
The sampling process of participants to reach the desired number was another limitation of this study. Some participants who were anticipated to have depth of knowledge in the subject were relatively passive.

Another limitation to this process was my work schedule which involves a lot of travelling hence the delay to complete the study.

CHAPTER 6 - CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

The exploratory qualitative study conducted at Maramba and Mahatma Gandhi clinics in Zambia demonstrates that influences of adoption of EMR can be complex and interrelated on several levels. The findings suggest that the adoption of EMR at Maramba and Mahatma Gandhi clinics was influenced by various patient management, data, health services/systems and information technology factors. The patient management factors that were identified in this study include efficiency in providing patient care, patient waiting times, continuity of care and patient monitoring. The data management factors identified in this study were data storage, retrieval of patient information, power cuts/load shedding, loss of smart cards and data errors. Information technology factors identified were lack of network connectivity, antivirus updates and hardware. Finally, health services/systems factors identified were staff attitude, shortage of manpower, staff training/orientation, computer literacy, patient records and missing files. Factors such as staff attitude, computer literacy and power cuts can be overcome with involvement of key stakeholders such as MoH leadership, cooperating partners and health care workers.



6.2 RECOMMENDATIONS

Full utilization of the EMR is still a challenge among health care workers in Zambia. To change this, health care workers, hospital and district management teams together with policy makers are important participants. To promote utilization of the EMR, several considerations must be made.

6.2.1 Recommendations regarding patient management factors

Patient management factors included efficiency in providing patient care, patient waiting times, continuity of care and patient monitoring. Health care workers need to be continuously enlightened on the benefits of EMR considering that some felt that the EMR would reduce their efficiency. Patients also need to be educated on the benefits of the EMR so that they understand why health care workers must use it especially in the case where waiting times are increased due to implementation of EMR.

6.2.2 Recommendations regarding data management factors

Power cuts/load shedding and data errors came out prominently as challenges to the implementation of the EMR. System developers need to ensure that all data elements contained in the reports provided for in the EMR are defined correctly to prevent wrong information being generated from reports. Power back-up supply such as inverters, solar panels and generators need to be considered simultaneously with the deployment of the EMR.

6.2.3 Recommendations regarding IT infrastructure

Lack of connectivity, antivirus updates and hardware were prominent among participants on EMR implementation. It is therefore imperative that a local area networks (LAN) rather than standalone systems are set up within health facilities and hospitals with internet connectivity available for antivirus updates. Computer hardware also needs to be supplied in adequate quantities to ensure all service areas are covered.



6.2.4 Recommendations regarding health services/systems factors

Computer literacy, staff attitude and staff training/orientations were prominent among health care workers on the adoption of the EMR. In this view, basic computing trainings/orientations need to be considered for health care workers for them to appreciate implementation of the EMR. Continuous and regular mentorship, trainings and onsite orientations in the EMR must be planned to assist staff get around the challenges they encounter in their day to day use of the system. This in turn might assist get around the challenge of staff attitude.

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APPENDIX 1: PARTICIPANT INFORMATION SHEET



UNIVERSITY OF THE WESTERN CAPE

School of Economic & Management Sciences

Private Bag X17 • BELLVILLE • 7535 • South Africa

Tel: 021- 959 2809, Fax: 021- 959 2872

PARTICIPANT INFORMATION SHEET

Dear participant

Thank you for giving me this opportunity to talk to you about this research. What follows is an explanation of the purpose of the research and an explanation of what will happen and what is expected of you if you agree to participate. The research is being conducted for a min-thesis which is a requirement for a Master's degree in Health Information Management; which I'm pursuing with the University of the Western Cape. If there is anything that you don't understand or not clear about, please do not hesitate to ask me. My contact details and that of my supervisors are recorded at the end of this memo.

TITLE OF RESEARCH

Perceptions and experiences of health care workers on the use of electronic medical records at the two largest health centres in Livingstone, Zambia.

PURPOSE AND CONTENT OF FGD

The research is trying to explore perceptions and experiences of health care workers on the use of electronic medical records. It is hoped that with your participation, a better understanding of perceptions and experiences will be gained. I plan to do with healthcare workers who have and have not used EMR. This is the reason why you have been chosen. Through interviewing people like yourself I hope to get information about your perception and your experiences of EMR.

DESCRIPTION OF THE STUDY AND YOUR INVOLVEMENT IN THE FOCUS GROUP DISCUSSION PROCESS

The focus group will only take a short time. Notes will be taken and tape recording will be done. Recording will be done to enable all information to be captured even if it was missed when note taking.

CONFIDENTIALITY

During the interview, there will be no use of names. A code will be used instead of your name. The discussions between you and me will be confidential. I shall keep all records of your participation and our discussions including a signed consent which I will need to get from you once you accept to participate in this research study, under lock and key at all times and will destroy them probably a year after the research is completed. You will not be identified in the written reports as they contain no names.

VOLUNTARY PARTICIPATION AND WITHDRAWAL

Participation in this study is entirely voluntary, that is you may or may not want to participate. If you choose to participate, you may stop at any time. You may also choose not to answer particular questions in the study that you feel uncomfortable with. If there is anything that you would prefer not to discuss, please feel free to say so.

BENEFITS AND COSTS

You may not get any direct benefit from this study. However, the information we will learn from participants in this study will contribute towards future expansion of EMR services in other health facilities.

INFORMED CONSENT (AGREEMENT)

Your signed consent (thumb print for those who cannot write) to participate and to be audio-recorded in this research is requested before I can proceed to interview you. I have included the consent form with this information sheet so that you can review the consent form and then decide whether you would like to participate in this study or not.

QUESTIONS

Should you have further questions or wish to know more, I can be contacted as follows:

Kaala Moomba

Student No. 2930764

Cell No. +260 977 886296 /+260 965 886296

E-mail: kmoomba@yahoo.com / kaalamoomba@gmail.com

My supervisor's contact details are as follows:

Prof. Brian Van Wyk

University of the Western Cape

Private Bag X17, Bellville 7535, South Africa

Tel. +27 21 959 2173

Fax. +27 21 959 2872

Email: bvanwyk@uwc.ac.za

APPENDIX 2: FOCUS GROUP DISCUSSION GUIDE

Introduction

1. Tell me your name and how long you have been using the EMR system.
2. Think back to when you first became involved with EMR. What were your first impressions?
3. Since the introduction of EMR how has your work changed? If so, how?
4. What type of activities do you use the EMR for?

Understanding Barriers and Benefits

1. What are the barriers or challenges that you experience in using EMR at the clinic?
2. What barriers have you observed your colleagues deal with while using EMR?
3. What do you think should be done to overcome these barriers?
4. Where is EMR most useful?
 - a. In what way has the introduction of EMR helped to improve the quality of care given to patients?
 - b. What should be done to make the EMR more useful to you?
 - c. What should be done to make the EMR more useful to patients?

Training and Continuous Professional Development

1. How do you rate your level of competence in use of the EMR? Explain?
2. Were you given any formal training or orientation on the use of the EMR before or after its implementation? Explain? (Probe on adequacy of training or orientation)
3. If you were asked to design a training or orientation package in the current EMR, what considerations would you take into account?
4. What gaps do you think exist in the current use of the EMR?

Conclusion

Could there be anything very critical we could have left out regarding the EMR that you feel should be considered? Explain?

Interview Closing Script

- Thank you all for spending time with me today, for sharing your opinions and experiences with me. Your participation in this discussion is helping us to better understand the (program).
- Since I've asked you so many questions today, do you have any questions for me?
- I learned a lot from our discussion today and enjoyed spending time with you (Recap)
- *Thank you very much!*

APPENDIX 3: FOCUS GROUP CONFIDENTIALITY BINDING FORM



UNIVERSITY OF THE WESTERN CAPE

School of Economic & Management Sciences
Private Bag X17 **BELLVILLE** 7535 South Africa
Tel: +260 97 7 886296' +260 96 5 886296

Project Title: Perceptions and experiences of health care workers on the use of electronic medical records at the two largest health centres in Livingstone, Zambia.

The study has been described to me in a language that I understand and I freely and voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may withdraw from the study without giving a reason at any time and this will not negatively affect me in the study. I also agree not to disclose any information that was discussed during the group discussion.

Participants name:.....

Participants signature:.....

Date:.....

Should you have any questions regarding this study or wish to report any problems you have experienced related to the study, please contact the researcher:

Researcher: Kaala Moomba

University of the Western Cape

Private Bag X17, Bellville 7535

Cell: +260 97 7 886296 / +260 96 5 886296

- Email: kmoomba@yahoo.com or kaalamoomba@gmail.com

APPENDIX 4: INFORMED CONSENT FORM



UNIVERSITY OF THE WESTERN CAPE

School of Economic & Management Sciences

Private Bag X17 • **BELLVILLE** • 7535 • South Africa

Tel: 021- 959 2809, Fax: 021- 959 2872

INFORMED CONSENT

Thank you for agreeing to allow me to interview you. I am Kaala Moomba a student at the School of Public Health, University of the Western Cape. As part of my MComm Information Management I'm required to do a research study. I will be focusing on barriers to adherence of antiretroviral drugs. I am accountable to Prof. Brian Van Wyk who is contactable at Fax: +2721 959 2872, Tel. +27 21 959 2173, email: bvanwyk@uwc.ac.za or at University of the Western Cape, Private Bag X17, Bellville 7535, South Africa.

THE TITLE OF THE RESEARCH IS:

Perceptions and experiences of health care workers on the use of electronic medical records at the two largest health centers in Livingstone, Zambia.

As mentioned in the participant information sheet: Participation in this research study is entirely voluntary, that is you may or may not want to participate. Refusal to participate or withdrawal from the study will not result in penalty or any loss of benefit to which you are otherwise entitled.

If you choose to participate you may stop at any time. You may also choose not to answer particular questions that are asked in the study. If there is anything that you prefer not to discuss please feel free to say so

The discussion and information collected in this study will be kept strictly confidential.

If you choose to participate in this study, your signed informed consent will be required before I proceed with the interview with you.

I have read/it has been read to me the information about this research study on the Participant's Information Sheet. I have had the opportunity to ask questions about it and any questions I have asked have been answered to my satisfaction.

I voluntarily consent to be a participant and be audio-recorded in this research study and understand that I have the right to end the interview/recording at any time, and choose not to answer particular questions that are asked in the study.

My signature indicates that I'm willing to participate and be recorded in this research.

Participant's Name: _____

Participant's Signature/Thumb print: _____ **Date:** _____

Interviewer's Signature: _____ **Date:** _____



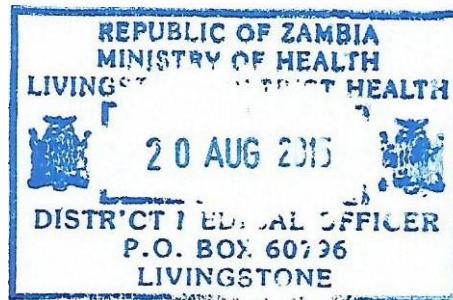
APPENDIX 5: PARTICIPANT DEMOGRAPHIC PROFILE

ITEM															
Which department within the health facility do you work?	_____														
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Has used EMR before	<table border="1"> <tr> <td><input type="checkbox"/></td> <td>Yes</td> </tr> <tr> <td><input type="checkbox"/></td> <td>No</td> </tr> </table>	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No										
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APPENDIX 6: DISTRICT CLEARANCE

PLOT LIV/7319
HIGHLANDS
LIVINGSTONE.

28 JUNE 2015



20/08/15
No objection
TTP

THE DISTRICT MEDICAL OFFICER
LIVINGSTONE.

Dear Dr. Hara,

RE: REQUEST FOR PERMISSION TO INVOLVE STAFF IN A STUDY

My name is Kaala Moomba. I am currently a student at the University of the Western Cape (UWC) in South Africa studying for a MComm Information Management (MComm 1M).

My research will focus on perceptions and experiences of health care workers on the use of electronic medical records. The study will be done at Maramba and Mahatma Gandhi health centres in Livingstone. The study will involve staffs working at different units/departments at the two health centres.

I am aware of your management's active involvement in trying to support the use of electronic medical records to improve health service data management in the two facilities. I am therefore requesting your good office for permission to involve some of your health staff at the two facilities in my study. The results will be shared with the District Community Medical Office (DCMO) management and facility staff as a way of enhancing knowledge in the use of electronic medical records.

Find attached a copy of my protocol and ethics clearance from the school.

Your assistance in this matter will be highly appreciated.

Sincerely Yours,

Kaala Moomba.

APPENDIX 7: UWC ETHICS APPROVAL



Mr. K Moomba (Information Systems)

Study project: Perception and experiences of health care workers on the use of electronic medical records at the two largest health centres in Livingstone, Zambia

Registration no: 15/5/15

Ethics: *Approved*

