RESEARCH PROJECT

PERCEIVED BENEFITS AND BARRIERS TO THE USE OF ELECTRONIC MEDICAL RECORDS AT HEALTH CENTRES LEVEL IN KIGALI

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PERCEIVED BENEFITS AND BARRIERS TO THE USE OF ELECTRONIC MEDICAL RECORDS AT HEALTH CENTRES LEVEL IN KIGALI

By

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A dissertation submitted in partial fulfillment of the requirements for the degree of

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Supervisor: Dr Santhi KUMARAN

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DECLARATION

I declare that this Dissertation contains my own work except where specifically acknowledged.

Marie Claire INEZA

12/PS/3949

Signed…….. Date……..

CERTIFICATION

This is to certify that this research work entitled

"Perceived benefits and barriers to the use of electronic medical records at health centres level in Kigali" is an original work, proposed and conducted by Marie Claire INEZA

as a result of her academic efforts, and was done under my supervision.

Dr Santhi KUMARAN

Signed…….. Date……..

DEDICATION

Heartily, I dedicate this piece of work, to the Almighty God, who created me, enabled, and guided me to elaborate the presented work in this research report.

I also dedicate this work to my beloved family my Husband and my daughters for their unconditional love and care that always strengthen and encourage me.

To my parents of their love and support

To my brothers and sisters,

To my best friends,

Thank you all.

May God bless you abundantly.

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ABSTRACT

Electronic Medical Records (EMRs) are widely perceived to improve care delivery that is why some professional organizations encourage widespread adoption even into primary care. According to the Millennium Development Goals (MDG) set by the United Nations, the reduction of risks to catch a disease is only possible if health services are oriented towards primary health care and prevention. However, in developing countries, the health sector faces barriers in implementation and promotion of health information technology such as EMRs. These barriers are hurdle to the widespread adoption of health technologies, and it is necessary to address these for a successful implementation.

In Rwanda, primary health care services are the first point of contact for patients. The inability of health care providers to share and access health information effectively, leads to difficulties in providing consistent, efficient and coordinated patient care in health centres (HCs). The efficient use of EMRs can promote prevention and adequate management of most diseases at primary care level.

The aim of the present research work was to carry out an assessment of the benefits and barriers to the use of Electronic Medical Records at Health Centres level.

The purpose of the research was to show that surveying the benefits and barriers to the use of EMRs can enhance primary health care in Rwanda, where a majority of the population utilizes a mutual health insurance, which requires each individual to seek care at health centre level. The results of this research can ultimately lead to improvement in the daily health care tasks, which can enhance patient health outcome and safety.

A cross-sectional design with census method was used to collect quantitative data from 52 health care providers who worked in eight selected health centres and who respondent to questionnaire. A questionnaire adapted to the study was used to collect data and the gathered quantitative data were analyzed using Statistical Package for Social Science (SPSS version 20) software and chi-square test was performed. The results indicated that the majority of users perceived several benefits, and thought that the EMRs can improve significantly the quality of care. Of 86.5% (n=45) participants agreed that the information of patient can be retrieved in a timely manner for example finding the level of CD4. The majority of users agreed that the generation of reports from EMRs was easily. Whereas, others thought that

using of EMRs seems to be an additional since they still used papers to records patient information prior to entering it in the electronic system. The study observed that the nurses have a large gap to overcome the lack of computer skills and confidence in managing electronic system. The proportion of perception of the EMRs usage as a double work to professional has been calculated, and chi-square was statistically significant (P=0.003).

In conclusion, the results of this study revealed that the users reported a full range of EMRs benefits, and they think the EMRs can improve significantly the quality of health care delivery. However the study observed that the nurses had insufficient knowledge of information technology and the resistance to change from paper based records as barriers. To overcome these challenges a long term and effective adoption of EMRs has to be reinforced by empowering the IT managers with medical knowledge, health care providers with computer skills, and providing necessary equipment at all the health institutional levels in Rwanda.

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LIST OF SYMBOLS AND ABBREVIATIONS/ACRONYMS

ARV - Antiretroviral

CDO - Care Delivery Organization

CD4 - Cluster of Differentiation 4

EHRs - Electronic Health Records System

EMRs - Electronic Medical Records System

HC - Health Centres

HCP - Health Care Providers

HIP - Partners In Health

HIT - Health Information Technology

IT - Information Technology

MDG - Millennium Development Goals

MOH - Ministry of Health

SPSS - Statistical Package for Social Sciences

WHO - World Health Organization

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CHAPTER 1. INTRODUCTION

1.0. INTRODUCTION

This document is a report on the research study of perceived benefits and barriers to the use of EMRs at health centre level in Rwanda. A growing but still limited number of primary health care have begun to look to electronic medical record (EMR) systems as a means to manage more effectively their growing volume of patient information. The reluctance to implement EMR systems in practice has been related to a host of factors: cost, data entry obstacles, lack of uniform standards, inexperienced vendors, patient confidentiality and security concerns, and legal issues. The relatively few practices that have implemented EMR systems have found that the gains for health care providers and patients have more than overcome the problems created by the obstacles. The purpose of this study is to assess the benefits and barriers that may be attributed to the use of an EMRs at health centres level (Tomasi et al. 2004).

1.1.OPERATIONAL DEFINITIONS OF KEY TERMS

Electronic Medical Records system (EMRs): the term EMRs refers to a patient-centred system that staff can use to fulfill their patient-care duties without using paper medical records. This represents a sophisticated EMR system that supports closed-loop medication management and real-time decision support (Analytics 2006).

Electronic Health Records system: is a systematic collection of electronic health information about individual patients or populations. It is a record in digital format that is theoretically capable of being shared across different health care settings (Bercovitz et al. 2013).

Health information technology: means hardware, software, integrated technologies or related licences, intellectual property, upgrades, or packaged solutions sold as services that are designed for or support the use by health care entities or patients for the electronic creation, maintenance, access, or exchange of health information. Technologies may include: Electronic Medical Records, personal health records, E-prescribing, health information exchange, analytics decision support, patient support tools, mobile health technologies (Blaya et al. 2010).

Health Centre: are community based and patient directed organization that serve population with limited access to health care (Mosby's Medical Dictionary, 2009).

Perception: the way in which something is regarded, understood, or interpreted.

Benefits: An advantage or profit gained from something.

Barriers: A circumstance or obstacle that keeps people or things apart or prevents communication or progress.

Health Care Providers: in this present study, health care provider means all nurses and general physician who work in health centres.

1.2. BACKGROUND TO THE STUDY

It is widely perceived that a broad adoption of health information technology systems will lead to major health care savings, improve practice efficiency, reduce medical errors, and enhance quality of care even if there has been little progress towards attaining these benefits. The motivation of using the health information technologies relies on the potential of reducing the complexity of multiple legacy, paper-based systems, upgrade capacity of health systems to manage patients and their data, increase compliance with health regulations, ensure availability of information to support a better health care service, and reinforce security around patient confidentiality (Hillestad et al. 2005).

Electronic Medical Records is one of health information technologies that is widely perceived to improve care delivery; therefore, professional organizations encourage its widespread adoption especially in primary care. However, there are numerous barriers to the adoption of Electronic Medical Records including cost, lack of standards and compatibility with existing systems and privacy concerns (Dorda et al. 2005).

In developed countries, EMRs are becoming a necessary component of health care in providing efficient, effective, accountable, high-quality health care along with accurate management of data information in a timely manner at all levels from primary care, to health facilities and to national ministries of health. A study in Denmark reported that–Danish physicians using EMRs benefit from a simple and repeatable procedure for medication prescription with an easy access to lists of generic drugs. A long process that used to involve pulling charts and handwriting a prescription is now reduced to only 10 seconds. Furthermore, Danish physicians declare

that they have much quicker access to all their patient data, particularly recent reports and results. Thus, they can finish all they need to do while the patient is still in the room (Sood et al. 2008).

In addition, it seems that, in developing countries the health information technology (HIT) can have a positive impact on communication between institutions. In particular, the HIT can be of great assistance in the process of ordering and managing medication, and detecting and monitoring patients who might abandon medical care (Sf et al. 2005). The Kenyan study showed that a primary healthcare centre in rural area used Mosoriot Medical Records System (MMRS), and provided both HIV patient registration and visit data collection functions. As a result, a comparative study of the clinic usage before and after adoption of the MMRS showed patient visits were 22% shorter, healthcare provider time per patient was reduced by 58% ($P < 0.001$), and patients spent 38% less time in clinic waiting rooms ($P < 0.06$); clinic personnel spent 50% less time interacting with patients, two-thirds less time interacting with each other, and more time in individual medical activities. Moreover, the MMRS has greatly simplified the generation of mandatory reports to the Kenyan Ministry of Health (Sf et al. 2005).

However, in developing countries the health sector is facing several barriers in implementation and promotion of health information technology. These barriers include lack of infrastructures, funds, time, skilled human resources, benefits analysis and e-readiness of medical professionals. These barriers are an obstacle to a widespread adoption of health technologies, and if addressed properly, a successful adoption will follow (Blaya et al. 2010).

In Sub-Saharan Africa, the use of EMRs such as Open Source Healthcare, (OpenMRS)–the most widely used software, has been increased, but a percentage of comprehensive implementation is still low. For example, in South Africa the health care system is poorly perceived because the investment in information technology (IT) is considered against the opportunity cost of improving health. It was observed that the benefits of the system are only fully understood and appreciated once all components including system automation, associated outcomes, and organizational factors are implemented, and holistic change management support has been applied (Hygiene 2013).

In Rwanda, the implementation of electronic medical record systems (EMRs) could enable clinicians to have a comprehensive access to patient data efficiently; however, it is still unclear that health care providers use EMR system. Therefore, Partners in Health (PIH) reported that a properly training of healthcare providers to use EMR system is needed, which

will allow care providers having the necessary, accurate information required to make appropriate and timely clinical decision concerning HIV/AIDS patients for their routine care and support (McGrath et al. 2004).

1.3. PROBLEM STATEMENT

Of the millions of men, women and children who die each year from HIV/AIDS, more than 95% of the infected, an astonishing number of 38 million people live in the developing world. The chronic diseases such as HIV/AIDS and tuberculosis (TB) require efficient medical record storage and retrieval systems; thus EMRs can be very useful due to its capacity to capture all necessary patient's medical history for routine HIV care support (Allen & Ave 2008). Since 2005, Partners in Health (PIH) have implemented EMRs in Rwanda to support and improve care of HIV and TB patients. But the EMRs is not yet well used in health services due to a poor perception of healthcare providers towards EMR; this misunderstanding comes mostly from the lack of mastering EMRs. Unfortunately, Rwandan health care providers think that using EMRs would be additional work to their daily duties. The MOH in Rwanda started implementing and enrolling EMRs in health facilities, particularly at the health centre level where the first point of contact of patient occurs (Gakuba 2013). The strategic emphasis on training of health care providers to the use of EMRs and increasing awareness of the effectiveness of health information technology systems used in health facilities as one of the parameters in overcoming the mentioned challenges.

1.4 OBJECTIVES OF THE STUDY

1.4.1 Main objective

EMR system is the most useful technology to the health care providers for instance on hospital levels. Despite the fact that the health centres are the first contact points with patients, the medical care personnel is reluctant to take advantage of EMR system mainly due to the mindset, poor technical skills and lack of IT equipment. The major objective of this study is to determine the benefits, barriers and the factors influencing the use of EMRs at Health Centre level.

1.4.2 Specific objectives

- To assess user perception on the factors influencing the use of EMRs at health centre level

- To determine user perception on the benefits and barriers of using EMRs at health centre level
- To assess the EMRs used at Health Centre level on improving quality of care.

1.5. RESEARCH QUESTIONS

- What is user's perception on benefits of using Electronic Medical Records at health center level?
- What is user's perception on barriers of using Electronic Medical Records at health center level?
- What is user's perception on factors influencing the use of Electronic Medical Records at health center level?

1.7 SIGNIFICANCE OF THE STUDY

The EMRs has the potential to greatly impact health service efficiency, the scalability of treatment delivery in developing countries, and patient outcomes (Gakuba 2013).

In Rwanda, PIH is assisting the Ministry of Health to address the human resource crisis in healthcare by focusing on improving the efficiency and effectiveness of the existing limited workforce through the deployment of reliable, easy to use electronic systems in high burden Antiretroviral Therapy (ART) clinics. So far these electronic medical systems have been deployed in few health centre and the Ministry of Health plans to scale up further. However, it is not clear how this electronic medical system work, how useful it is to users and whether training the users is provided before they start using the EMR system.

This study was conducted to help the policy makers to provide a strategic plan for further using of EMRs in laboratory test results, immunization records, and other relevant patient information.

Also, it will give source of information to other researchers for knowing the perception of healthcare providers by using EMRs in health centre in urban area.

This study will help Ministry of Health to know the challenges; some healthcare providers are facing in using EMRs at health centre level.

1.8 SUBDIVISION OF THE PROJECT

The present report is divided in five main chapters. The introductory chapter that provides definitions of key terms, background of the study, problem statement, objectives, research questions, hypothesis, significance (i.e. Rationale) and subdivision of the project. The second chapter (Literature review) describes the previous studies done on the presented topic, either related and /or the same in different countries, continents and regions. The third chapter (Methodology) explains in the details the way the study was conducted; it includes the study area, design, population, sample size, sample strategy, data collection procedure, ethical consideration, limitations and problems. Chapter four (Presentation of Results) shows the results from the study with a descriptive statistical analysis of the sample population and leads to an exploratory factor analysis of the proposed hypothesis. Then chapter five (Conclusion and recommendations) gives concluding remarks, points out areas of needed encouragement and improvements, and also makes suggestions on the use of the current research work.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

A number of recent studies suggest that information technology has been proposed as an essential tool for improving the quality of care delivery and promoting better health care (Care et al. 2010). Health information technology such as EMRs consists of set of technologies with a great diversion for transmitting and managing healthcare data (David and John, 2007).

The use of health information technology has been proven to offer evidence based practice to endorse health and human prosperity. This implies that the use of computer in the form of Electronic Medical Records is very important part of constantly changing environment of health care system, which includes reduced paper work in hospital environment. As a result, medical errors can be minimized, and health related information can be well communicated (Bercovitz et al. 2013).

However the health sector of developing societies is facing several barriers in establishment and promotion of health information system (Hygiene 2013). The use of EMRs is still low and meets resistance from clinicians, by overcoming those barriers there can be a potential improvement of health status of population that can starts at the primary care level (Ajami & Bagheri-Tadi 2013).

2.2. REVIEW OF STUDIES

2.2.1 The health information technologies used at primary care

The Deloitte Center for Health Solutions 2013, has found that most American primary care physicians (PCPs) perceive efficiencies in terms of faster and more accurate billing with time saving through e-prescribing as the principal benefits of health information technologies . In general, American primary physicians who use HIT, are optimistic about its prospects for better care and lower administrative costs once fully integrated.

Furthermore, Bate and coworkers have observed that physicians perceive potential benefits from implementing IT. Their recent survey on medical IT perception of American primary care physicians found that almost 75% indicated that these applications could reduce errors; 70% perceived IT as potentially increasing their productivity; over 60% indicated that IT

tools have the potential to reduce costs and help patients assume more responsibility (Bates et al. n.d.).
Hospitals are daily handling and processing a large amount of information in their routines regarding diagnostic investigation, treatment and patient care. Thus the computer, with its amazing speed and capacity, should be able to assist the health care system in handling the vast amount of information (Lærum 2000).

In Rwanda, all healthcare facilities rely heavily on paper-based records. In primary care the ability to access and share health information is very limited. Almost all healthcare centers have few computers and no connection to each other or to the internet. In 2010 at least 100 primary healthcare facilities per year, patient health information is expected to be maintained in a standardized, shareable, electronic form. Therefore improved information management and technology can help primary health care to improve patient health outcomes and patient safety (Gakuba 2013).

2.2.2 The perceived benefits of using EMRs at primary care

Danish primary care physicians observed that there are benefits from improved communications and efficiency by using their computers. They reported an enhanced level of dialogues with hospitals; for example, receiving test results as soon as they are available, as opposed to the former wait time of about five days. Some Danish primary care physicians have said that EMRs save one hour per day of staff work time (Protti 2010).

Although the full range of EMR benefits will not become clear until more systems are implemented and more processes are computerized such as laboratory tests and e-prescribing. Computerization of medication prescribing improves safety; in one study of inpatients, the medication error rate was reduced by more than 80%. Communication between patients and providers appears to represent a particular problem in outpatient care, and computerization may be helpful in this domain (Steiner 2009). Another quality improvement benefit will likely come from monitoring, tracking abnormal results, and how EMRs facilitate sharing medical information between patients and providers; therefore, EMR systems can already improve efficiency and quality of medical care services (Victorian 2012).

The potential benefits of using electronic medical records over paper records in improving the quality of healthcare delivery have been extensively studied. The EMR promises rapid access to health information, which leads to improved healthcare outcomes and more efficient use of resources. For example, the US Institute of Medicine has presented EMR as essential technology for healthcare in the 21st century (US Institute of Medicine 2001). This Institute reports that EMRs emphasises the critical role played by IT in achieving patient safety, effectiveness, patient centredness, timeliness, efficiency and equity of healthcare. This study showed that 83.1% agreed the EMRs is a necessity in clinical practice, 61.1% agreed that it can significantly improve the quality of patient care, whereas 53.9% reported that the computers are more beneficial for administrative than clinical functions, and 51.9% reported that training the staff is a lot of effort, but the other percentage of staff remained neutral about this statement (Ochieng & Hosoi 2006).

Another concern is about the patient information safety since EMRs provides complete and accurate information, which is accessible from anywhere through a networked environment or a mobile smart card that a patient carries with him/her. If appropriate security measures are adopted, computerization also provides greater protection of confidential information via sophisticated access key controls (Hillestad et al. 2005). Additionally, the EMRs system helps improve the quality of patient visit documentation and data, by eliminating time spent hunting down lost charts, and provides timely and easily patient records (Steiner 2009).

Since then, several successful medical information systems and EMRs have been implemented in developing countries and information technology is much more widely available in resource-poor areas. These factors, along with recognition of the benefits of EMRs in improving quality of care in developed countries, have created a broad interest in the use of health information technology systems (HIT) in the management of diseases such as HIV and drug-resistant TB.
in Rwanda, Gakuba reported that the integration of Electronic Medical Records, and chronic disease such as HIV/AIDS and tuberculosis management functionalities will enable automated information sharing and facilitate improved patient outcomes (Gakuba 2013).

2.2.3 The perceived barriers of using EMRs at primary care

Miller & Sim, 2004 observed that over 80% of primary care physicians surveyed reported the lack of financial support for IT applications as a major barrier to adoption. Almost two-thirds

of the physicians surveyed also cited the lack of a strategic plan for implementing applications and difficulty in recruiting experienced IT personnel as major barriers while over one-half cited lack of sufficient knowledge of IT as a barrier to implementation (Miller & Sim 2004).

In 2005, Hillestad and collaborators studied significant barriers that impede a widespread adoption and use of EMR systems. These barriers include lack of implementation capital by health care providers, complex systems, and lack of standards for exchange of clinical data, privacy concerns and legal barriers. The strategies to overcome the mentioned barriers will require the roles of payers and government in terms of subsidies and performance incentives. Additionally, clinical data exchange will be required to achieve greater interoperability, legal barriers will need to be systematically removed, and confidential security of medical data must be guaranteed in order to convince practitioners and patients of the value of EMRs (Hillestad et al. 2005).

Bergefeld observed that the major barrier of using EMRs by nurses is an addition of one more item to their work day. The thought of adding one more task to an already frantic day can justifiably seem daunting (Bergefeld 2010). On the other hand, physician resistance to use of EMR systems is another issue. The authors believe that the resistance stems from physicians' perceptions that EMR usage negatively affects their workflows. For example, data entry may take extra time, which is the most precious commodity to physicians (Ajami & Bagheri-Tadi 2013).

Furthermore, the concern about security and confidentiality of electronic information is an important issue, and essentially much work remains to be done in order to develop and assess security strategies. Fortunately, the basic technology to ensure data safety is currently available (Anwar 2011).

Another prominent issue comes from a combination of limited IT knowledge on behalf of healthcare providers and limited medical knowledge on behalf of IT professionals; this trend is speculated to severely affect EMR adoption and implementation. With the ultimate goal of increased quality of patient care, EMR software designs should incorporate medical terminology, secure data integrity, mirror practice workflow and provide the flexibility necessary for all relevant patient information. In short, physicians must learn the language of technology, and IT professionals must learn also the language of medicine (Kemper et al. 2006).

In addition, Anderson observed that primary care physicians in general, perceive benefits to information technology, but also they cite major barriers to its implementation in their practices. These barriers are the lack of access to capital by healthcare providers, complex systems, and lack of standards for exchange of clinical data, privacy concerns and legal barriers. Overcoming these barriers will require subsidies and performance incentives from sponsors and government; and greater security of medical data to convince practitioners and patients of the value of EMRs (Anderson n.d.).

2.2.4 The factors influencing the use of EMRs

Countries such as the United States, United Kingdom and Australia have mature and advanced healthcare infrastructures that receive substantial funding and support from their governments. Although, significant failures still exist in these systems, there is strong support and motivation to accomplish goals associated with comprehensive development of successful medical information technology systems (Msukwa 2011).

In addition, nurses' acceptance of computer technology became the one of the factors influencing the use of system and indispensable to successful implementation. Early studies evaluated nurses' attitudes toward computers in relation to years of education and years of nursing. Results revealed that the nurses with more education, had more favorable attitudes toward computers. Nurses who had worked longer also had a more favorable attitude toward computers. The same study found that nurses' confidence levels in use of technology were lower than expected, especially in relation to software applications (Journal & Nursing 2010).

PIH in Rwanda learnt that well-trained data entry persons are required to maintain an EMR system; the team also learnt that at least 4 months of on job-training is needed to properly train data entry persons. Data entry persons must have the ability to solve problems and follow up ambiguous or suspect data, and IT support persons must be available. Care providers must also be trained to properly report changes in treatment (Allen et al. 2006).

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2.2.5 Concept framework

The concepts used in this research work focus on perception and acceptance levels on the behalf of healthcare providers towards–health information technologies especially EMRs.

This study has measured health care providers' perceived effects of electronic documentation on patient care in the ARV department.

In our research efforts, we have adapted the technology acceptance model (TAM), which seeks to measure the predictor variables of user intent and user behavior. The used model TAM was developed by Davis in 1989 (Davis et al. 1989), and is considered the most influential model of user acceptance of information technologies. Thus, TAM provides in our study along with the conceptual framework an analysis of independent antecedent variables of IT/EMR utilization.

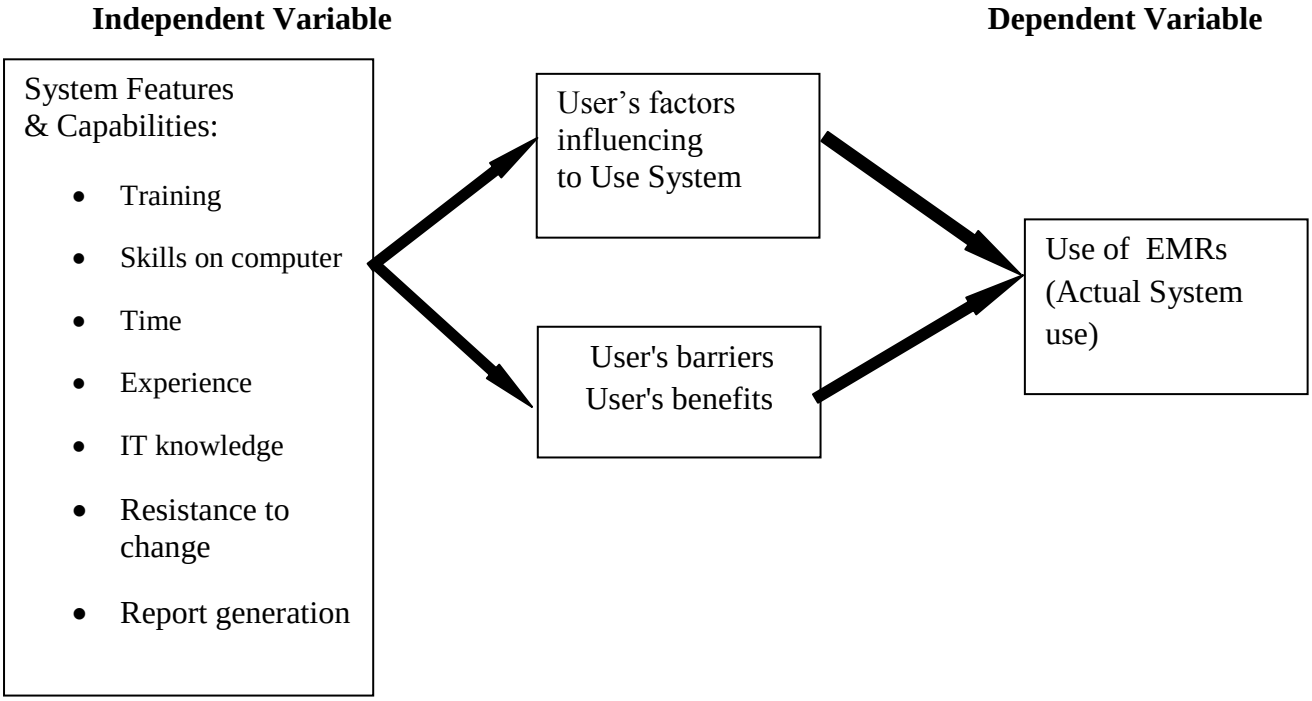

Figure 1: Concept framework

This conceptual framework shows us the independent and dependent variables, where it indicates that use of EMRs as dependent variable will depend on different variables like Training, Experience and skills on computers of the users have been indicated in this study as influence factors on the use of EMRs. Time, IT knowledge and resistance to change as a barrier to the use of EMRs. The report generation, time and IT knowledge as benefits to the use of EMRs.

CHAPTER 3: METHODOLOGY

This chapter presents the procedures followed during the collection of data from the respondents, data processing and eventual analysis. The research was conducted within the quantitative research using a non-experimental research design. This chapter is composed of the following sections; the study area, study design, study population, study sample and sampling strategies, data collection methods and data analysis, problems and limitations of the study and finally ethical considerations

3.1 STUDY AREA

The study was used census sampling strategy to get study participants. Eight Health Centres sites with EMRs implemented and adopted within the Kigali, they were Gitega HC, Muhima HC, Biryogo HC, Cor-unum HC, Gikondo HC, Kicukiro HC, Masaka HC, and Kinyinya HC. All health care providers, data entry clerk, and IT Manager from the eight sites will be eligible to take part in the study after giving a written consent.

3.2 STUDY DESIGN

A cross sectional study with census method, using quantitative was used to determine the perceived benefits and barriers to the use of EMRs at health centres level. A cross sectional study with census method was used because of limited time for data collection and low number of health care providers (EMRs users) at these health centers. The census is the method of data collection where each and every item or unit constituting the universe is selected for data collection, this study is quantitative ,as defined here a quantitative research is ‘explaining phenomena by collecting numerical data that are analyzed using mathematically based methods in particular statistics” (Sukamolson, 2012).

3.3 STUDY POPULATION

The population for this research was defined as Health care providers, data entry clerk, and IT Manager who use EMRs and who have been used it in 8 selected health centres during the

study period. The estimated size of study population was 52 EMRs users found eight selected health centers in Kigali city.

Inclusion criteria:

- Health care providers, data entry clerk and IT Manager present on the day of data collection.
- Health care providers, data entry clerk and IT Manager who consent to be interviewed within the selected health centres.
- Health care providers who have exclusively used EMRs and who was assigned on service which use EMRs on the day of data collection.

Exclusion criteria:

- Health care providers not trained to use EMRs .
- Health care providers not available on the day of data collection

3.4 SAMPLE SIZE

All users from the eight health centres were eligible to take part in this study after giving a written consent. There was 52 available and consent to participate, no one who denied participating in this study.

3.5 SAMPLING STRATEGY

A census method was employed to the study participants, within 52 health care works in health centre within Kigali based on the inclusion criteria, because a census method is a technique where data is collected from the whole population rather than a sample.

3.6 DATA COLLECTION METHODS AND PROCEDURES USED

A structured questionnaire was used to obtain data on perceived benefits and barriers to the use of EMRs at Health Centres level. The questionnaire was adopted and composed of closed ended questions. It was prepared in English and organized in five sections.

Section A was assessed the demographic characteristic of the participants with 4 questions. Section B was assessed 3 questions on general use of EMRs and paper based, section C was assessed 7 questions on factors influencing the use of EMRs. Section D was assessed on perceived benefits and barriers to the use of EMRs with the questions measured by using 5Likert scale ranging from "strongly agree" to "agree", "neutral", "disagree" to "strongly disagree". Then section E on perception of other health information technologies used at health centres level.

The structured questionnaire that was used and adopted from the questionnaire used by similar studies about users perception on electronic medical records . Data collection tools were pretested for validity and feasibility and appropriate corrections were made before the actual study was done.

The data collection was starting after being authorized by clearance committee of UR-College of medicine and Health Sciences. Thereafter, the researcher wrote a letter to the In charge of health centres requesting the permission for data collection .After getting the response from the health centre as permit for data collection, the researcher introduced to the head of departments of ARV in each health center and explain the purpose of this research.
At the time of data collection, the users who was be available, was given explanation about the study briefly and asked to volunteer and consent to participate in the study.

3.7 DATA ANALYSIS

The data was analysed quantitatively after its collection, using SPSS version 20, Transcription of recordings and typing of field notes was done soon after each data collection event and frequency tables with percentages was made. The closed and open ended questions were analysed, used recorded information from a structured questionnaire. The response format was based on 5-Point Likert scale. Level of significance was fixed at $p \leq 0.05$. Frequencies as part of descriptive statistics were used to describe the data.

3.8 PROBLEMS AND LIMITATIONS OF THE STUDY

There were limitations to this study; this study required a greater deal of time for data collection and the availability of respondents. There was not sufficient theory generation to broaden the scope of the study at this time.

Firstly, the sample size was limited due to the time and to the availability of EMRs users in only ARV service at health centres level, that why this research may not be generalised nationaly.

Secondly, due to the limited time in which the research was undertaken, a questionnaire was used to obtain the data. However, the respondents would have been interviewed, it would have been possible to ensure that the Health Care Providers (HCPs) understood the questions, and it would have been possible to clarify both the research questions if necessary, and the HCPs' responses.

3.9 ETHICAL CONSIDERATION

Researcher had been granted to conduct the study by a permission with Ethical Clearance Committee from College of Medicine and Health Sciences. Then the researcher wrote a letter to the in charge of selected health centres to allow her to collect data in their respective health centre.

Every health care providers who was participated in the study was given explanations concerning the study, was consent and participation in the study was voluntary. All information was collected from the research was confidential and was used for study purposes only. To ensure confidentiality each participant had their completed questionnaire and consent form folder and put into the file system. Health care provider’s names was not mentioned on study questionnaire.

CHAPTER 4: RESULTS PRESENTATION

4.1 INTRODUCTION

In this chapter, the results of the study was analysed using statistical package for social science (SPSS) version 20, the data were presented and described by means of tables, charts and percentages . The presentation also are based on the instrument used (questionnaire).

It includes demographic data for a description of the study sample and its characteristics, factors influencing the use of EMRs, then perception on benefits and barriers to the use of EMRs at Health Centres level and assessment of health information technologies used on improving quality of care at health centre.

4.2 DEMOGRAPHIC PROFILE

The study had fifty-two participants and all gave written consent to participate. Participants differed with respect to profession, length of use of the EMR, age, and were from eight different Health Centres. The study took place in three districts that were using the EMR procured and run by the Ministry of Health. Of the thirty-one participants, 48% were from Nyarugenge, 38.5% from Kicukiro and 13.5% from Gasabo. The study had 53.8% female participants and 46.2% male participants. The table of age distribution of users showed that the minimum age group was 20-25 years and maximum age group was above 32 years. The mean age group was 26 -31 years. Table 1 and figure 1 below summarize the demographic data of the study participants.

Table 1: Demographic participant's profile

Description of participant (N= 52)		Frequency	%
Gender	Male	24	46.2
	Female	28	53.8
Age	20-25	18	34.6
	26- 31	22	42.3
	32 and above	12	23.1
Work Place	Nyarugenge District	25	48.1
	Kicukiro District	20	38.5
	Gasabo District	7	13.5

Of the fifty-two participants, 63.5% were nurses, 11.5% were Data entry clerks, 15.4% were IT Manager and 9% were Social workers. Figure 1 below summarizes the profession of participants that took part in the study.

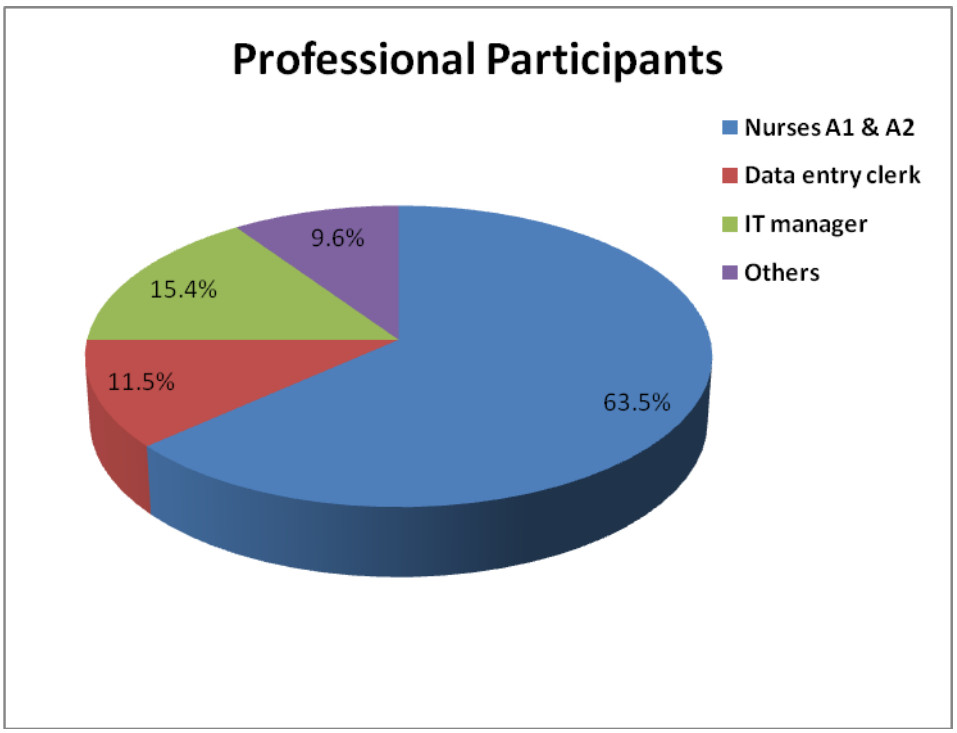

Figure 2: Professional Participants

4.3 FACTORS INFLUENCING THE USE OF EMRs

4.3.1 Experiences of user

Participants in the study had different experience levels in using the EMR; the user trend is exemplified by table 2, which shows the period that participants had worked in health centres, and the time frame in which they used EMR in ART service and paper based records. The majority of participants (71.2%) had been working at health centres for more than one year, and had been using paper based records (46.2%). The study also revealed that 76.9 % of participants had used the EMR for more than one year on the date of data collection.

Table 2: Experience of users

	Time worked in Health Centre	Time used EMRs	Time used paper records
Less than 1 year	2 (3.8)	10 (19.2)	
1 - 5 years	37 (71.2)	40 (76.9)	24 (46.2)
Above 5 years	13 (25)	2 (3.8)	13 (25)

4.3.2 Effect of EMRs comparing to Paper based records

There were mixed responses on specific functions of both records as quantified by table 3. All the twenty one (44.2%) participants, who are nurses, indicated that paper based records were more accurate and complete. Their main reason was that the EMR only has very few predefined conditions that users especially nurses need to indicate, but most necessary conditions omitted in the EMR system, could be easily written down on paper based records. The other reason was that paper based records allow nurses to write down the detailed record of patients such as medical history, physical examination results and diagnosis, which cannot be collected using the EMR. However, 86.5 % (N = 45) of participants thought that information in the EMR is more secure than in paper based records due to the protection through access key of a username and a password.

Table 3: Effect of EMRs

	Information more complete	Information more accurate	Information more safer
EMRs	23 (44.2)	22 (42.3)	45 (86.5)
Paper based records	21 (40.4)	21 (40.4)	1 (1.9)
Both are the same	8 (15.4)	9 (17.3)	6 (11.5)

4.3.3 Users Training

The Ministry of Health provided all trainings to prepare users of EMR system. Among fifty two participants in the study, only 57.7% (n = 30) strongly agreed that their preparation was sufficient to start using EMR after the training sessions, and 32.7% (n =17) of participants just agreed that they were ready to use it while 9.6% (n = 5) of participants had a neutral opinion on their preparation toward using EMR. These results are presented in figure 4.

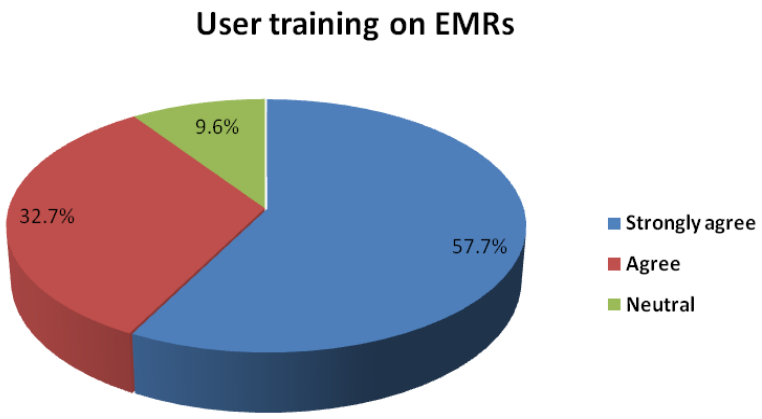

Figure 3: Opinions of trained users about adopting EMR system

4.3.4 Correlation between owning a computer and having computer skills

The proportion scores of owning a computer and having skills on computer have been calculated, and chi-square statistical analysis has been performed. The obtained results indicated that owning a computer is statistically significant to acquiring the computer skills (P = 0.003) as shown in table 4 below.

Table 4: Correlation between owning a computer and having computer skills

Having computer	**Perception on skills of using computer**			
	Agree	**Disagree**	**Chi-square**	**P value**
yes	7(26.9%)	18(69.2%)	9.321	0.003
No	19(73.1%)	8(30.8%)		
Total	**26(100%)**	**26(100%)**		

4.4 STATEMENT ADDRESSING THE FREQUENCY OF PERCEIVED BENEFITS TO THE USE OF EMRs

Table 5: Perceived benefits

Statements	Agree N(%)	Disagree N(%)
Improved diagnosis and treatment	34 (65.4)	18 (34.6)
Fewer errors found within personal health records	28 (53.9)	24 (46.2)
Faster care and decision making from assigned medical professional	37 (71.2)	15 (28.8)
Ability to increase the number of patient received per day	37 (71.1)	15 (28.8)
Improved patient management by reduction of medical error	30 (57.7)	22 (42.3)
The system provide sufficient information about patient status	25 (46.2)	28 (53.8)
The system is user - friendly	43 (82.7)	9 (17.3)
You get the information of patient you need in time (for example the level of CD4)	45 (86.5)	7 (13.5)
It provide up-to-date information about patient	31 (59.6)	21 (40.4)
The EMRs reports are easier to generate	46 (88.5)	6 (11.5)
The generated reports from EMRs are accurate	35 (67.3)	17 (32.7)

The findings in table 6 indicates that 88.5% (n = 46) thought that EMRs report are easy to generate, and 86.5% (n=45) of participants agreed that the information of patient can be

retrieved in a timely manner for example finding the level of CD4. About 82.7% (n = 43) of participants reported that the system is user friendly. But 53.8% disagreed that the system provides sufficient information about patient status. The findings are summarized in the table above.

4.5 STATEMENT ADDRESSING THE FREQUENCY OF PERCEIVED BARRIERS TO THE USE OF EMRs

The majority of participants, that is 78.8% (n = 41) of participants agreed that the use of EMRs seems to be a double work, and this perception is the main barrier; the reason behind it, is that the nurses were still using the patient file before recording in the EMR system. The other perceived barriers came from 70.1% of the lack of sufficient knowledge on the behalf of IT personnel (n = 37) and 75% of the resistance to change from paper based records to EMRs (n=39). A few number of respondents disagreed that data security (9.6%) and lack of privacy and confidentiality (13.5%) are barriers to the use of EMRs as shown below.

Table 6: Perceived barriers

Statements on Barriers to the use of EMRs	**Agree** N (%)	**Disagree** N (%)
I am worried about data security	5 (9.6)	47 (90.4)
The lack of privacy and confidentiality	7 (13.5)	45 (86.5)
The use of the EMRs seems to be the double work	**41 (78.8)**	**11 (21.2)**
The lack of sufficient knowledge of IT	**37 (70.1)**	**15 (28.9)**
My skills about EMRs are very limited	**12 (23.1)**	**40 (76.9)**
The resistance to change from paper based records to EMRs	**39 (75)**	**13 (25)**
The lack of interoperability within health facilities	**36 (69.2)**	**16 (30.8)**

4.5.1 Correlation of perceiving EMRs as a double work

Furthermore, the results indicated that using EMRs seems to be a double work for health care workers and administrative staff. The proportion of perception of the EMRs usage as a double work to professional has been calculated, and chi-square was statistically significant (P=0.010) according to the results summarized below in table 7.

Table 7*:* Correlation of perceiving EMRs as a double work

Professional	**Using EMRs seems a double work**			
	Agree	**Disagree**	**Chi-square**	**P value**
Health Care workers	33(82.5%)	5(41.7%)	7.823	0.010
Administrative workers	7(17.5%)	7(58.3%)		
Total	39(100%)	13(100%)		

4.5 ASSESSMENT OF HEALTH INFORMATION TECHNOLOGIES ON QUALITY OF CARE

Since the implementation of the EMRs at health centre level, 50% (n = 26) of participants thought that the quality of health care has significantly improved, while 42.3% (n = 22) of participants reported that the quality of health care improved a little, and only 7.7% (n = 4) thought that there was no change in improvement of quality of health care. The findings were showed in the figure 4 bellow.

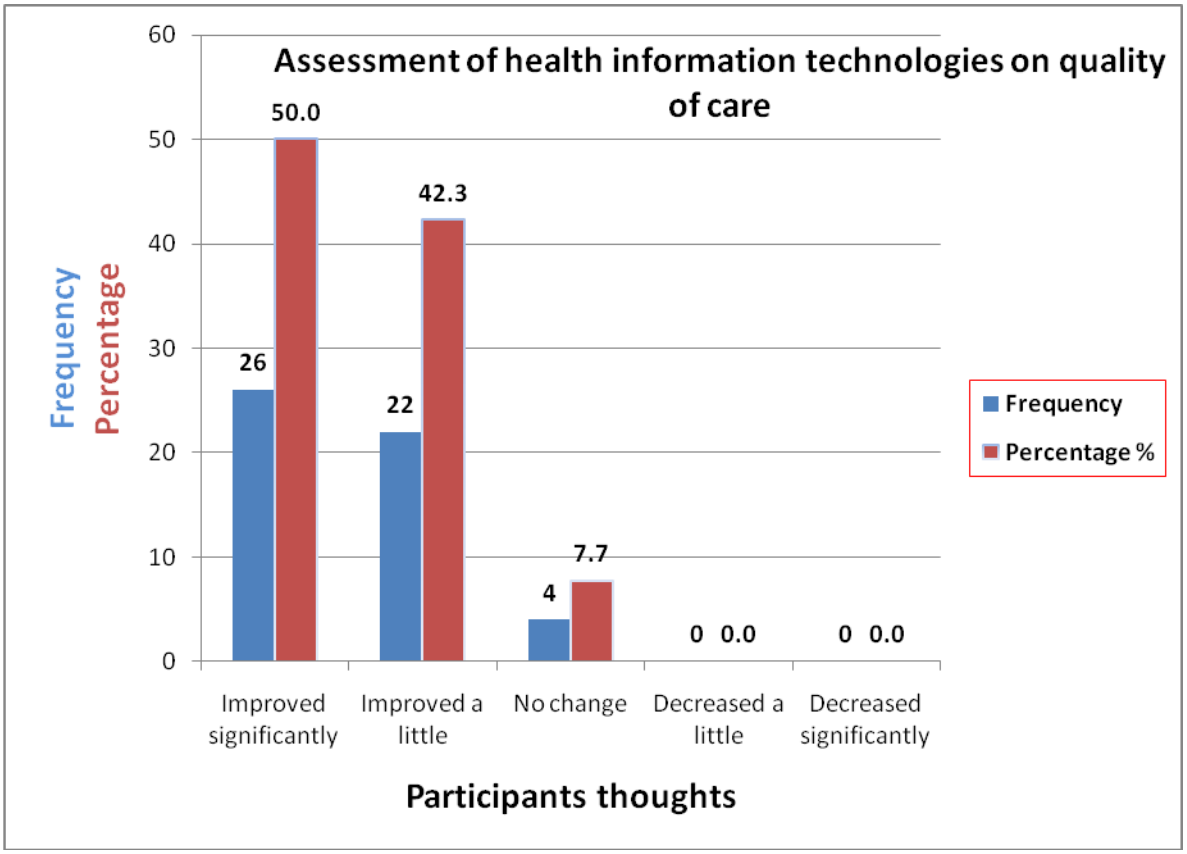

Figure 4: Impact of health information technology on quality of health care

With an open question, the respondents perceived that the EMRs can improve the quality of care, they were based on the following statements:

- Providers spend more time taking patients' history and doing physical examination than wasting a lot of time with paper work.
- The EMR is able to automatically calculate dates of appointments and specific number of pills to be given to the patient instead of providers doing it manually; hence efficiency in task performance is increased
- The EMR is able to automatically find the level of CD4 of the patient at every visit and able to alert the provider if the CD4 is low so the patient can receive appropriate management.
- The EMR is able to automatically assess patients' adherence using the date of last appointment, number of pills dispensed and remaining pills on the date of the visit. If they find patient adherence is no good the provider can refer the patient for adherence counseling.

- The EMR has a list of all antiretroviral side effects that have to always be checked at every visit by the provider. These act as checklist for providers to effectively monitor side effects on all patients. It can help to change the treatment of patient early.

- With EMR the provider can easily get all information of the patients' health even if the patient loses a health passport as long as they give the provider their full name and village and this helps promote the continuity of care.

- The EMRs facilitate our task and our service is delivery very fast

Only four respondents who indicated that the quality of care have not changed pointed out in summary those two following opinions:

- The EMRs need to accommodate more information because there are still a lot of gaps with the EMRs especially the limitation in the information of patient it captures.

- The EMRs can improve quality of care if MOH can make effort to update the EMR system every year and can be implemented in other service of health facility.

CHAPTER 5: DISCUSSION

The fifth chapter covers the discussions of the main points found in the present research work in relation with the other previous studies done on the treated topic. The discussion is given in four themes as the following: demographics information, factors influencing the use of EMRs, perceived benefits and barriers to the use of EMRs, and the perception of health information technology on improvement of quality of health care.

5.1 DEMOGRAPHIC INFORMATION

The population age (42.3%) in different health centres was in the range of 26 to 31 years and, the observed age trend is an agreement with the national workforce characteristics (Morgan 2011). The majority of respondents were nurses, who use EMRs at 63.5%. On the gender side, female response rate was 53.8% versus 46.2% of male response rate; these results are similar to the findings from the previous study done by Samia and Sayeed. The same authors reported that in a sample size of 130 participants, 53.8% were nurse, and female rate was 51.5% versus 48.5 % of male rate. .

In addition, the current research showed that the demographic profile of the fifty two participants included 63.5% nurses, 11.5% data entry clerks, 15.4% IT Manager and 9% social workers. Similarly, in india the sample population was represented with 8.5% physician, 49.2% nurses 19.6% administrators, and 22.7 % others because using EMRs depends on variety of professionals (Pera et al. 2014) .

5.2 FACTORS INFLUENCING THE USE OF EMRs

The majority of respondents (71.2%) had been working at health centres for more than one year (1 to 5 years) and had been using paper based records (46.2%). Furthermore, the research revealed that 76.9 % of participants had used the EMR for more than one year (1 to 5 years) on the date of the interview. These findings are in agreement with the report from Gakuba that the MOH in Rwanda enrolled the EMRs (OpenMRS) at health centre level in 2009 (Gakuba 2013). But, the EMR system is simultaneously used with paper record systems. Interestingly, a similar study in India showed that the maximum respondents (70.9%) had 1 to 5 years experience in using EMRs after being trained, and had been working in hospitals for more than 3 years (Lwanga & Lemeshow 1991).

While comparing the previous case studies to the current research results, it was observed among health information managers (38.6%), the largest category had 20 or more years of experience in using health information technologies, and the smallest category (7.1%) had five or fewer years of experience. The observed trend is expected since the population surveyed was comprised of health information managers, who would tend to have more experience in management and supervision of a department. In contrast to the demographic profile of the majority (80%) being 36 years old or above in other studies, the current research had 42% of participants of the age between 26 and 31 years (Lakbala & Dindarloo 2014).

As shown on the table 3, 86.5 % of participants (n = 45) thought that information in the EMR system is more secure than in paper based records because EMR system is protected via username and password. Compared to a previous study on the perception of electronic medical records by nurse, Pera et al. reported that 25% of participants were comfortable working with paper records system whereas 75% were comfortable working with EMR system (Pera et al. 2014).

The previously mentioned study in Denmark indicated that the majority of primary care physicians use their EMRs to capture clinical notes including all medication prescriptions, but all of them do not use paper records. Due to the interoperability of the EMRs system and pharmacy system, an easy access to drug database ensures accurate dispensing, and offers decision and support abilities (Protti 2010).

The current study reported that 44.2 % of participants (n = 21) who are nurses indicated that paper records were more accurate and more complete. On one hand, a similar observation was made in India where many physicians reported that it might be more convenient and efficient to use paper records during the clinical visit because using EMRs would take more time for each patient (Lai Md Ccfp et al. 2009). On the other hand, a different study reported that in regard to the quality of care, 90% to 98% physician respondents agreed that the EMRs system provides the necessary patient information with accuracy, and most of the nurses (60% to 71%) agreed that EMRs system frequently provides the information they need, and are satisfied with the accuracy of EMRs system (Laughman & Rodriguez 2013) .

The present research revealed that 57.7% (n = 30) strongly agree that their preparation was sufficient to start using EMR after the training, 32.7% (n = 17) agreed that training was adequate while 9.6% (n=5) were neutral on their preparation to use EMR after the training.

While the current report proves that the EMRs system provides an enormous range of functions, the general observation is that it simply takes time for users to understand what EMRs can do and how it can be done (Lakbala & Dindarloo 2014) . Another study observed that there have been few studies done on what the ideal training period for potential EMR users to undergo before they are confident to use the system. There is no clear literature either from developed or developing countries that have well stipulated training guidelines or recommendations developed to reinforce standard training preparation for all potential users of the electronic medical records (Raghupathi & Gao 2007). As a consequence, the training for users in the eight health centres where the research took place was different at every site, and it did neither consider educational background nor previous exposure and experience of individuals to computer use. However, taking into account the basic computer skills of the potential EMR users, would help trainers estimate the length of time and amount of effort required to put into the EMRs training sessions in order to make sure that they are well prepared to adopt the EMR system (Lowes 2004).

In a previous study, physicians reported that the EMRs vendors simply offered one training session for one half to a full day. Often the training was soon after implementation, but physicians were not fully acquainted with the basics of their new EMRs system to ask relevant questions or appreciate the given answers. Unfortunately, after training session, they could not always have access to the vendor technical support. Although initial formal training was depicted favorably by some physicals, insufficient training was often identified due to limited training time (Hillestad et al. 2005).

Statistical significance found between the association of having own computer and the skills on computer is statistically significant ($P< 0.05$). Those results are supported by Samia and Sayeeda who reported that , gender and computer related experience (previous PC experience, having computer at home, frequency of daily PC usage, ease of data input and typing ability) have also significantly correlated with various aspects of use, quality and user satisfaction with EMR. Male showed higher usage and satisfaction with EMR compared to females. Respondents with computer at home and ability to input data at ease frequently used

EMR and believed it to be an important and successful system for their hospital (Samia & Sayeeda 2013).

5.3 PERCEIVED BENEFITS TO THE USE OF EMRs

The results summarized in table 5 pointed out that 88.5% (n = 46) thought that EMRs reports are easily generated, and 86.5% (n = 45) agreed they could get the information of patient that they need in time such as the level of CD4. About 82.7% (n = 43) of participants reported that the system is user friendly, while 53.8% disagreed that the system provide sufficient information about patient status.

As compared with the previous study results, there is a little difference in that 61% of nurses agreed that EMRs system is user friendly, 83% physicians and 60% nurses accepted that EMRs system provides timely information, and 90% of health care providers believe that EMRs provide them necessary information of patient (Sykes et al. 2011).

The findings from the study by Poissant et al. also indicated that clerks spent additional time registering patients but less time writing reports. For them, the EMRs was remarkably time saving in terms of producing monthly reports for the Kenyan Ministry of Health. What was observed in the study by Poissant et al. is similar to the findings in our study where 88.5% of participants indicated that the EMRs generated reports were much easier to generate compared to paper based report generation (Poissant et al. 2005).

5.4 PERCEIVED BARRIERS TO THE USE OF EMRs

The present study revealed that 70.1% of respondents (n = 37) perceived the lack of sufficient knowledge of information technology as a barrier. This observation is correlated with a study done by Rose and Sherman who pointed out that the EMRs providers seem to underestimate the level of computer skills required from physicians. Furthermore, good typing skills are needed to enter patient medical information, notes and prescription into EMRs, and the author indicated that physicians lack the skills. (Rose and Sherman 2011).

Smeler et al. reported in their study that the first failure of medical system was a physician's rejection of new system because the physician found that there were severe limitations on their ability to make medical judgment, daily overwhelming electronic reminders, questions and alerts

with the new system. Finally, several hundred physicians refused to use the electronic system, and the administration was forced to cancel the implementation. Compared to the current research result, there was a similar tendency of respondents (75%) who agreed that the major barrier to the use of EMRs is the resistance to change from paper based records (Smeler et al. 2010) .

In addition, another study pointed out that more than 80% of physicians show their resistance to EMR and their positive attitude towards implementation of EMRs. This is an interesting result because physician resistance may be a result of factors such as EMRs issue, usefulness and ease-of-use technology rather than EMRs functions and benefits (Hsiao & Hwang 2011). Several nurse leaders would readily admit that one of their most significant challenges is dealing with fast pace changes in the health care environment. Health organizations are introducing new technologies and electronic medical records that are inducing a change in medical practice (Mohd et al. 2005).

Ehr et al. found that nurses do not resist technology itself; the motive for resistance is the addition of one more item to their workload. A significant point of resistance may come from the mindset of nurses that electronic charting will take more time than paper charting. The current research results in table 6 demonstrated that the majority of respondents (78.8%) perceived the use of EMRs seems as the double work, and the reason behind this perception is that the nurses were still using the patient file before recording in electronic system (Ehr et al. 2010).

In present study, 69% of respondents reported that lack of interoperability between health facilities is one of the challenges they had to deal with. The limited interoperability in Rwanda was also observed by Frasier and colleagues between institution and another. Government of Rwanda would like to overcome of these issues, but an absence of funding is still a challenge.(Frasier et al, 2008).

Although, in this present study the association of perception of using EMRs as a double work and professional was statistically significantly (P=0.010). This result is different with a study done by (Joos et al. 2006) who indicated that the gender and users professional were not correlated with their perception about EMRs as in addition work however respondent's satisfaction with implementation was positively correlated with their perception about EMRs speed.

5.5 ASSESSMENT OF HEALTH INFORMATION TECHNOLOGIES ON QUALITY OF CARE

Hing and Hsiao reported that once the EMR system is implemented, physicians can provide better care because there is time saving on searching the patient's charts due to an electronic storage of information. In general, physician notes and prescriptions are no longer difficult to read because they are typed (Hing & Hsiao 2010). The 26 participants over fifty two in the current study indicated that quality of patient care improved significantly with the introduction of EMRs, and preferred using EMRs than paper based records. Another improvement observed by both participant groups is the ability to monitor patient progress (65% of nurses, 81.8% of physicians, $p = 0.298$). They perceived improvement in quality of patient care as a result of using EMRs, which is helpful in their daily work (Hsiao & Hwang 2011).

Clinicians spend the majority of their time providing direct care to patient, and hope that the EMRs can enhance the quality time during interaction with patient; consequently increase the quality of care delivered. Usually, provision of care requires the documentation of clinical information as an intrinsic aspect of routine clinical task, and is essential from both professional and legal standpoints. Thus, clinicians will consider a system to be efficient if it reduces their documentation time (Samia & Sayeeda 2013).

Studies have also proved that adoption of electronic medical record systems can lead to major health care savings, reduce medical errors and improve health care delivery (Smeler et al. 2010). The present research, warnings on drug interactions, drug side effects, reminders and alerts on patient CD4 level of patient stored in the EMRs and notices of poor adherence of patient were some of the factors that users have identified as the major reasons for the improved quality of patient's care, the key benefit of using EMRs .

While Bates and collegues confirm that the full range of EMR benefits were not become clear until more systems are implemented and more processes computerized, the current study demonstrates that EMR systems can already improve efficiency and quality of health care. Few of respondent of the study reported that the EMRs can improve quality of care if it can be implemented in other services of health facilities as it is used in ART service at the health centre level (Bates et al. n.d.)

In Rwanda, Frasier et al observed in 2008 that OpenMRS, TRACnet, Camerwa, and HMIS, all health technologies represent necessary components of managing a complex health system, a process which requires significant financial investment and restructuring the system in order to optimize the factors that promote health care services with better quality (Frasier et al. 2008).

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

The present research assessed the factors that influencing the use of EMRs, perceived benefits and barriers to the use of EMRs, and the impact of health information technologies on quality of care at health centre level in Rwanda.

In overall, though there are barriers to the widespread adoption of EMRs, the majority of users perceived several benefits, and thought that the EMRs can improve significantly the quality of care. The respondents, especially the nurse need a systematic training for the use of EMRs in order to achieve a successful and complete adoption. Furthermore, the majority of users considered that the information of EMRs is secure than paper based records while the paper records still give a more complete and accurate information.

The majority of users agreed that the generation of reports from EMRs was easy with a fast access to needed medical information. Whereas, others thought that using of EMRs seems to be an additional since they still used papers to records patient information prior to entering it in the electronic system. The study observed that the nurses have a large gap to overcome the lack of computer skills and confidence in managing electronic system.

In conclusion, the users reported a full range of EMRs benefits, and they think the EMRs can improve significantly the quality of health care delivery by EMR the provider can easily get all information of the patients' health even if the patient loses a health passport as long as they give the provider their full name and village and this helps promote the continuity of care. While there are still a lot of gaps with the EMRs especially not be updated periodically. Finally there is a need for further research studies to be carried out in order to evaluate the use of EMRs nationwide at primary health care level in Rwanda.

6.2 RECOMMENDATIONS

Following the results and concluding remarks of the present study, the researcher gives the key recommendations, which are addressed to the major players in the health care system.

To Ministry of Health:

The MOH should facilitate the use of EMRs at health centre level through mobilisation of efforts in both updating the EMR system each year and training systematically the potential users. In addition, it is necessary to implement the EMRs system in all health institution levels and services for reduction of paper records and efficient health care delivery. Finally, a long term and effective adoption of EMRs has to be reinforced by empowering the IT managers with medical knowledge, health care providers with computer skills, and providing necessary equipment at all the health institutional levels in Rwanda.

To Health care workers (especially nurses):

The health care providers, especially nurses need to put effort on improving their typing and computer skills so that they can make an easy transition from paper based records system to EMRs; then they can significantly increase their productivity, and they also can be competitive in the current electronically oriented society.

To Researcher

Further, it is important to provide a solid education to the Rwandan young people, who will be the future health care providers, and it is necessary to equip them both with knowledge and skills in the fields of medicine and information technology because it will ensure the complete and permanent replacement of paper records by electronic records system. Finally, a comprehensive similar research work should be carried out to include all health care services both in urban and rural areas. The results of the study could lead to understanding important factors that would promote a national adoption of electronic medical records system and provide guidelines on the EMRs training standardization.

REFERENCES LIST

Allen C, Manyika P, Jazayeri D, Rich M, Lesh N, Fraser H. Rapid deployment of electronic medical records for ARV rollout in rural Rwanda. 2006:840

Ajami, S. & Bagheri-Tadi, T., 2013. Barriers for adopting electronic health records (EHRs) by physicians. *Acta Informatica Medica*, 21(2), pp.129–134.

Analytics, H., 2006. Electronic Medical Records vs . Electronic Health Records : Yes , There Is a Difference By Dave Garets and Mike Davis Updated January 26 , 2006 HIMSS Analytics , LLC 230 E . Ohio St ., Suite 600 Chicago , IL 60611-3270 EMR vs . EHR : Definitions The marke. , pp.1–14.

Bates, D.W. et al., A proposal for electronic medical records in U.S. primary care. *Journal of the American Medical Informatics Association : JAMIA*, 10(1), pp.1–10.

Bercovitz, A.R. et al., 2013. Adoption and Use of Electronic Health Records and Mobile Technology by Home Health and Hospice Care Agencies. , (66).

Bergefeld, M., 2010. Resistance of Nurses to Transition to an Electronic Medical Record (EMR). *Canadian journal of nursing informatics*, 5(2), pp.16–25.

Blaya, J. a, Fraser, H.S.F. & Holt, B., 2010. E-health technologies show promise in developing countries. *Health affairs (Project Hope)*, 29(2), pp.244–51.

Gakuba, B.R., 2013. THE NATIONAL E-HEALTH. , pp.1–53.

Hillestad, R. et al., 2005. Can electronic medical record systems transform health care? Potential health benefits, savings, and costs. *Health affairs (Project Hope)*, 24(5), pp.1103–1117.

Joos, D. et al., 2006. An electronic medical record in primary care: impact on satisfaction, work efficiency and clinic processes. *AMIA ... Annual Symposium proceedings / AMIA Symposium. AMIA Symposium*, pp.394–398.

Lai Md Ccfp, J.K., Lau PhD, F. & Shaw Fbcs Citp, N., 2009. A study of information technology use and implementation of electronic medical record systems in BC medical practices. *British Columbia Medical Journal*, 51(3), pp.114–121.

Lakbala, P. & Dindarloo, K., 2014. Physicians' perception and attitude toward electronic medical record. *SpringerPlus*, 3(1), p.63.

Laughman, K. & Rodriguez, L., 2013. Meaningful Use in the Age of EMR What hospitals and physicians must take heed of to incent. , (September).

Lowes, R., 2004. EMR success: training is the key. *Medical economics*, 81(9), pp.TCP11–P14.

McGrath D, Herbst K, Fraser HS. Electronic Medical Record (EMR) systems for HIV care in resource poor settings: report from an international workshop. Int Conf AIDS. 2004 Jul 11-16;15 Abstract no. ThPeB7159.

Morgan, H.B., 2011. Ministry of Health. *Rwanda human resources for health strategic plan 2011-2016*.

Pera, N.K., Kaur, A. & Raveendra rao, 2014. Perception of electronic medical records (EMRs) by nursing staff in a teaching hospital in India Pera NK, Kaur A, Rao R - Int J Adv Med Health Res. , pp.75–80.

Poissant, L. et al., 2005. The Impact of Electronic Health Records on Time Efficiency of Physicians and Nurses A Systematic Review. , pp.505– 516.

Protti, D., 2010. Issues in International Health Policy Widespread Adoption of Information Technology in Primary Care Physician Offices in Denmark : A Case Study. , 80(March).

Raghupathi, W. & Gao, W., 2007. An Eclipse-based development approach to health information technology. *International journal of electronic healthcare*, 3(4), pp.433–452.

Rose o. Sherman, 2011. Why is Change so Hard _ Emerging Nurse Leader.

Samia, Z. & Sayeeda, A., 2013. Evaluation of EMR Implementation in a Private Hospital from User's Perspective. *International Journal of Nursing and health care*, 1(1), pp.143–147.

Smeler, J.B., Jacob, H.M.- & Knantrovich, L., 2010. Usability of Electronic Medical RecordsJUS. , pp.70–84.

Steiner, B.A., 2009. Electronic Medical Records implementation in nursing: a literature review of the factors of success. , (April).

Sukamolson, S., 2012. Fundamentals of quantitative research. Retrieved On 25.

Sykes, T.A., Venkatesh, V. & Rai, A., 2011. Explaining physicians' use of EMR systems and performance in the shakedown phase. , pp.125–130.

Tomasi, E., Facchini, L.A. & Maia, M.D.F.S., 2004. Health information technology in primary health care in developing countries: a literature review. *Bulletin of the World Health Organization*, 82(11), pp.867–74.

APPENDICES

APPENDIX I: PARTICIPANT INFORMATION SHEET

I am Marie Claire INEZA, a student at University of Rwanda, College of Medicine and Health Sciences, School of Health Sciences in Health Informatics department. I am now conducting a research for the fulfillment of the requirements for the Master's degree. The title of my study is "PERCEIVED BARRIERS AND BENEFITS TO THE USE OF EMRs AT HEALTH CENTRES LEVEL". That study will be conducted in Health Centres within Kigali.

I elaborated this questionnaire in order to get some information from you, which will be utilized for the best interests of the Rwandan community. I invite you to answer this kindly, and I ensure you that the information you give is helpful and that your answers will be treated with confidentiality by avoiding the appearance of the name on the answer sheet. Your answers will be used for scientific purpose only.

Instructions: Do not mention your names

Answer all questions following the instructions

More than one answer is possible for some questions

APPENDIX II: CONSENT FORM

You are invited to participate in a research study conducted by INEZA Marie Claire, entitled PERCEIVED BARRIERS AND BENEFITS TO THE USE OF EMRs AT HEALTH CENTRES LEVEL IN KIGALI". I am a student at UR-CMHS Nyarugenge campus.

I consent to participate in this research voluntary with no known benefits; and I permit the researcher to utilize the information given by me and results obtained from this study should be used for presentation and publication.

I have read this consent form and have been given the opportunity to ask questions. I give my consent to participate in this study.

Participant's signature_____ Date: _____

Researcher contact:

INEZA Marie Claire

E-mail: m.c.ineza@gmail.com

Tel: +250 788610585

Kigali, RWANDA.

APPENDIX III: QUESTIONNAIRE ON PERCEIVED BARRIERS AND BENEFITS TO THE USE OF EMRs AT HEALTH CENTRES LEVEL.

Code number: .....

Date of interview: ...../...../2014

A. Demographics: Information about the interviewer

1. Gender: Male Female
2. Age:
3. What is your profession?

   NurseA0 NurseA2 Data entry clerk

   NurseA1 Physician IT Manager

   Others Specify.....

4. How long have you worked in this Health center?(Precise in month and year)

B. General use of EMRs and paper based records (check with this sign√)

(NB: EMR (Electronicmedical records) in this study refer to OpenMRS)

5. Have you been used electronic medical records?***YesNo***
6. If yes, for how long have you been using electronic medical records? **(Precise in month and year)**
7. How long have you been using paper based medical records? **(Precise in month and year)**
8. In which is the information about patients more completes (no missing data)?

   EMRs ☐

   Paper based records ☐

   Both are about the same ☐

9. In which is the information about patients more accurate?

   EMRs ☐

   Paper based records ☐

   Both are about the same ☐

10. In which is the information about patients safer? (privacy)

    EMRs ☐

Paper based records ☐

Both are about the same ☐

C. Factors influencing the use of EMRs

11. Do you have your own computer? ***Yes*** ***No***

12. Have taken a course on computer?***Yes*** ***No***

If yes, in the past, how oftendidyou use the computer?

Neverrarely1x/month 1x/week daily

13. Do you have computer in your office?***Yes*** ***No***

Ifyes, how much computers do you have?

14. Do you agree to be familiarized with computers makes EMRs easy to use?

Strongly disagree DisagreeNeutreAgree Strongly agree

15. Did you receive any training to help you to use EMRs?***Yes*** ***No***

16. If yes,Who trained you to use the EMR system?

No one ☐

By the MHO ☐

By other colleagues ☐

By other, specify.....

17. What type of training did you receive to introduce you to use EMRs?

Training on computer skills ☐

Training on medical software ☐

Other training, specify.....

18. How did you agree the training have been prepared you to use the EMRs

Strongly disagree ☐

Disagree ☐

Not sure ☐

Agree ☐

Strongly agree ☐

19. Did you still get any support after the training?***Yes*** ***No***

If yes, what do they support you with?

Data cleaning ☐

System repair ☐

System up grade ☐

Others, Specify .....

20. Do you receive other support from outside other than MOH?***Yes*** ***No***

If, yes specify the type of support you received.....

D. Perception of other health information technologies used at health facilities

21. Have been used any other health information technology before or after EMRs?***YesNo***

If yes, specify.....

22. Which other health information is used in your health facilities?

Mobile health (mhealth) ☐

EMRs (not OpenMRS) ☐

Others,

Specify…….

23. Do you think these health information technologies (Mobile Health, EMRs) used at health facilities could improve the quality of health care delivery? (such as diagnosis, treatment and prevention of diseases) *Improved significantly improved a little No change decreased a little decreased significantly*

If yes, explain your answer.....

If no, explain your answer.....

E. Perceived benefits to the use of EMRs

24. Check to the correct Answer

Statements	**Strongly disagree**	**Disagree**	**Neutral**	**agree**	**Strongly agree**
Benefits of using EMRs For the patient					
Improved diagnosis and treatment					
fewer errors found within personal health records					
Faster care and decision making from assigned medical professional					
Benefits of using EMRs For the medical staff					
Provide the ability to share patient data					
Ability to increase the number of patient received per day					
Improved patient management by reduction of medical error					
The system provide sufficient information about patient status					
The system is user - friendly					
You get the information of patient you need in time (for example the level of CD4)					
It provide up-to-date information about patient					
Benefits of using EMRs For the department					
The EMRs reports are easier to generate					
The generated reports from EMRs are accurate					
It takes short time to generate a report using EMRs					

F. Perceived barriers to the use of EMRs

25. Check to the correct answer

Statements on Barriers to the use of EMRs	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
I am worried about data security					
The lack of privacy and confidentiality is a barrier					
The use of the EMRs seems to be the double work					
The lack of the backup of data is a barrier					
The lack of sufficient knowledge of IT is a barrier					
My skills about EMRs are very limited					
The resistance to change from paper based records to EMRs is a barrier					
The lack of interoperability within health facilities is a barrier					

E. Comments

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.....

(Anon, Evaluation of electronic medical records - Questionnaire 1. , pp.1–6.)

THANKS FOR GIVING YOUR TIME.

UNIVERSITY OF RWANDA — COLLEGE OF MEDICINE AND HEALTH SCIENCES

Research Centre

June 10th, 2014

Ref: UR/RECC/153/2014

Dear

INEZA Marie Claire

Master of Health Informatics Program

RE: ETHICAL CLEARANCE CERTIFICATE & APPROVAL FOR DATA COLLECTION

With reference to the application for Research and Ethical clearance; and approval for data collection for the study entitled **" Perceived Benefits and Barriers to the Use of Electronic Medical Records at Health Center Level"**

Following the review of your research proposal by Research, Ethics and Consultancy Committee in accordance with the authority granted to it; the reviewers recommended that your study be granted a Research and ethical certificate. It is on this note that the Directorate of Research, Ethics and Consultancy also grants approval for data collection. You will be required to submit the progress report and any major changes made in the proposal during the implementation stage. Also at the end of the study, the Directorate of Research, Ethics and Consultancy shall need to be given the final report of the study.

I wish you success in your study.

Mr. KANYONI Maurice

Chairperson of Research Ethics and Consultancy Committee

Cc:

- Principal, College of Medicine and Health Sciences
- Director of Postgraduate studies
- Director of Research Centre

UNIVERSITY OF RWANDA

COLLEGE OF MEDICINE AND HEALTH SCIENCES

OFFICE OF POSTGRADUATE STUDIES

Kigali, on 14/07/ 2014
N° 60/UR-CMHS /DPGS/14

The Director
Health Center (s)

Dear Directors,

SUBJECT: REQUEST FOR PERSMISSION TO DO RESERCH IN YOUR HEALTH CENTERS

Kindly refer to the heading of this letter.

In the process of fulfilling the partial requirement for the award of Master of Science in Health Informatics students are required to write a dissertation in their area of study. In that regard, **INEZA Marie Claire** has been granted ethical clearance to conduct a study entitled **"Perceived benefits and Barrier to the use of Electronic Medical Records at Health Centers Level: Gitega , Muhima, Biryogo, Cor-num, Kicukiro, Masaka, Kimironko, Kinyinya, Gikondo and Kacyiru."**

I will therefore highly appreciate if you could allow the student to conduct the study in your Hospital.

Thank you in advance for your assistance.

Prof Kato J. NJUNWA
Director of Postgraduate Studies
College of Medicine of Medicine and Health Sciences
University of Rwanda

Cc:
- Academic Registrar, UR-CMHS
- Director of Research, UR-CMHS
- Coordinator of Health Informatics, UR-CMHS

UNIVERSITY OF RWANDA *COLLEGE OF MEDICINE AND HEALTH SCIENCES*

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Prof Kato J. NJUNWA

Director of Postgraduate Studies
College of Medicine of Medicine and Health Sciences
University of Rwanda

Pour reception Nikuze
Muhima 4/9/13

Cc:

- Academic Registrar, UR-CMHS
- Director of Research, UR-CMHS
- Coordinator of Health Informatics, UR-CMHS

CARITAS DE L'ARCHIDIOCESE DE KIGALI

B.P. 3378 Kigali Tél. : (250) 25257 86 51 ;
(250) 78 874 33 21
E-mail : caritaskigali@yahoo.fr

Kigali le 3/9/2014

Objet: Autorisation de mener une étude

A Madame INEZA Marie Claire

Madame;

Référence faite à votre lettre du 14/7/2014 dont l'objet consistait à demander une autorisation de mener une étude sur la ***«Perceived benefits and barriers to use of Electronic Medical Records at Health Centers Level»*** au sein de nos cinq Formations sanitaires à savoir **Biryogo, Masaka, Kicukiro, et Gikondo, et cor unum,** nous avons le plaisir de vous informer que cette autorisation vous est accordée avec bienveillance et vous souhaitons à l'occasion un travail fructueux.

Abbé Donatien TWIZEYUMUREMYI
Directeur de la Caritas Kigali
Archidiocèse de Kigali

CPI :

- Titulaire du CMS de BIRYOGO
- Titulaire du CS de MASAKA
- Titulaire du CS de KABUGA
- Mme Titulaire du CS de KICUKIRO
- Titulaire du CMS de GIKONDO
- Sr Titulaire du CMS COR UNUM

UNIVERSITY OF RWANDA

COLLEGE OF MEDICINE AND HEALTH SCIENCES

OFFICE OF POSTGRADUATE STUDIES

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N° 60/UR-CMHS /DPGS/14

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Kindly refer to the heading of this letter.

In the process of fulfilling the partial requirement for the award of Master of Science in Health Informatics students are required to write a dissertation in their area of study. In that regard, **INEZA Marie Claire** has been granted ethical clearance to conduct a study entitled **"Perceived benefits and Barrier to the use of Electronic Medical Records at Health Centers Level".** For that purpose we are requesting permission for the student to collect Data from the following Health Centers: **Gitega , Muhima, Biryogo, Cor-num, Kicukiro, Masaka, Kimironko, Kinyinya and Kacyiru.**

I will therefore highly appreciate if you could allow the student to conduct the study in your Health Center.

Thank you in advance for your assistance.

Prof Kato J. NJUNWA

Director of Postgraduate Studies
College of Medicine and Health Sciences
University of Rwanda

Cc:

- Academic Registrar, UR-CMHS
- Director of Research, UR-CMHS
- Coordinator of Health Informatics, UR-CMHS