A CASE STUDY TO INVESTIGATE THE CHALLENGES OF EMR IMPLEMENTATION IN FOUR DISTRICT HOSPITALS IN RWANDA

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November 2016

DECLARATION

I hereby declare that this Master's thesis entitled "A Case Study to Investigate the Challenges of EMR Implementation in Four District Hospitals in Rwanda" is a presentation of my original research work.

Wherever contributions of others are involved, every effort is made to indicate this clearly, with due reference to the literature, and acknowledgement of collaborative research and discussions.

The work was done under the guidance of Dr. Rex Wong, School of Health Sciences, College of Medicine and Health Science, University of Rwanda.

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Place: Kigali

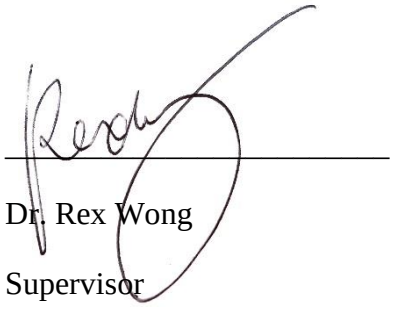
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CERTIFICATION

This is to certify that the work incorporated in the thesis “A Case Study to Investigate the Challenges on EMR Implementation in Four District Hospitals in Rwanda” submitted by Boney Mutabazi was carried out by the candidate under my guidance. Any materials obtained from other sources have been duly acknowledged in the thesis.



Place: Kigali

Date: November 2016

Dr. Rex Wong

Supervisor

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ABSTRACT

***Purpose*:** Although there are numerous documented advantages and benefits in incorporating electronic medical record (EMR) in patient care management, to support acute and chronic disease management, use of these systems by clinicians for patient monitoring and management is limited in many sub-Saharan African countries, including Rwanda.

Method: A cross sectional study was conducted to investigate the challenges of EMR implementation in 4 urban district hospitals in Kigali, Rwanda. The study was designed to understand the EMR users' system knowledge, and factors surrounding their satisfaction. A questionnaire with Likert-scale and open-ended questions was administered to hospital workers who used EMR on daily basis.

***Results*:** 64 respondents completed the questionnaires. The study showed most respondents were in favor of EMR. All respondents unanimously accepted the importance for hospitals to use EMR systems. A significant of percentage of respondents preferred the EMR over manual paper based systems and would recommend EMR to other users. This results indicated in general users have positive attitude towards EMR, regardless their professional category or the amount of EMR training they have received. People found EMR system was easy to navigate and perform data entry. Despite the general favorable opinion, EMR did not affect the productivity of staff. It is evident that insufficient training was still a major implementation gap. Not only a significant portion of users did not receive any EMR training, among the ones who had, the majority only had less than 20 hours training. Most respondents requested to add or enhance the functions to the EMR system, possibly include report generation and billing; which could probably increase the productivity too.

Conclusions: Overall, there is positive attitude about the contributions of an EMR system and system usage and user satisfaction is largely influenced by perceived usefulness. More training should be provided to the users. Features and functions of EMR should also be customized to meet the needs of individual departments. Internet connectivity and computer maintenance services remain a challenge. Effort should be provided to maintain and support EMR on ongoing basis. It will be beneficial to establish a central help desk that can support the implementation and to streamline the support process. Adopting evidence-based best implementation practices from other similar programs that was proven successful could also be beneficial. Similar study to include more hospitals and more samples as EMR rolls out to more hospitals should be conducted to quantify any resulting change in attitudes. Other important areas of EMR worth studying include cost, efficiency, accuracy, and data quality.

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LIST OF SYMBOLS AND ACRONYM

AIDS	Acquired Immune Deficiency Syndrome
AMPATH	Academic Model for the Prevention and Treatment of HIV
AMRS	AMPATH Medical Record System.
CMHS	College of Medicine and Health Sciences
COE	Computer Order Entry
COLD	Computer Output to Laser Disk
CPR	Computer-based Patient Record
DIMS	Document Imaging Management Systems
DHIS	District Health Information System
EMR	Electronic Medical Records
ERM	Electronic Report Management
GoR	Government of Rwanda
HER	Electronic Health Records
HIV	Human Immune Virus
HIS	Health Information System
ICT	Information Communication Technology
IOM	Institute of Medicine
IRB	Institutional Review Board
IS	Information System
LMIC	Low and Middle Income Countries
MMRS	Mosoriot Medical Records System
MoH	Ministry of Health
PMIS	Patient Management Information System
RIS	Radiology Information System
SPSS	Statistical Package for the Social Sciences
USA	United States of America
VCT	Voluntary Counselling and testing
WHO	World Health Organization
WWW	World Wide Web

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CHAPTER ONE: INTRODUCTION

1.1 Background

Similar to other low and middle income countries (LMIC), Rwanda continues to face considerable challenges in providing high-quality, affordable and universally accessible health care (1). In order to overcome some geographic and financial barriers to healthcare, the interest in utilizing information communication technology (ICT) and mobile technology for health in LMIC's has been mounting in recent years. For instance, the World Health Organization (WHO) has proliferated the growth of m-health projects like the Rapid SMS across such countries(2).

Hospitals in Rwanda have been mainly using paper-based health records. In recent years, with the increased demand data-driven decision making, the desire for health information greatly increased. Coupled with the advance in technologies significantly increased the data storage capacity (3), various healthcare facilities have begun to implement electronic medical records systems (EMRs); OpenMRS and OpenClinic are among some of the systems being implemented in Rwanda. This kind of implementation presents a structural and work process changes; in which people have to change the way they work (4). Hence, it may take some time before the tangible system benefits can be realized..

EMR systems in Europe and USA in the past two decades have helped improving quality of healthcare delivery and reducing drug admission errors (5). EMR was also used to enhance patient information exchange among clinicians and support decision making in chronic care management (6). In LMIC, EMR are, however, mostly used only in managing HIV/AIDS care and was driven by global initiatives to combat HIV and AIDS. While this is important, the long term HIV care requires an effective and sustainable method to comprehensively monitor and manage patients' care (7). Hence, developing comprehensive systems that manage this disparity remains critical.

As the electronic hardware becomes more robust, affordable, and power efficient, and as internet connectivity becomes more stable and accessible (8), a significant number and types of EMR systems have emerged (9); some commonly used systems in many countries include DHIS, OpenMRS, OpenELIS, Baobab Health Trust, SmartCare and IQCare (10–12).
Although there are numerous documented advantages and benefits in incorporating EMR in patient care management, including improved care quality, enhanced patient safety and

reduced operating costs (12); there are also challenges and barriers in implementation, including negative beliefs, behaviors and attitudes of healthcare professionals towards EMR, lack of availability and accessibility of technology, high cost, lack of technical expertise and ICT infrastructure, and low computer literacy among clinicians and nurses (13 -14).

The implementation of EMR in Rwanda has been similar to many other developing countries in sub Saharan Africa. Rwanda has over 1161 health facilities as of year 2014 (15) and has been using paper-based medical records for decades. In the late 1990s and early 2000s, EMR was introduced to Rwanda by The Gestion du Système d'Information Sanitaire (GESIS or Health Management Information System). Managed by the Government of Rwanda (GoR), the GESIS was set up to collect and provide national information primary on health. Evidence, however, suggested that the available health information was rarely used in health services decision making; EMRs were not set up to support physicians' and nurses' clinical decision making needs, but were instead only used as reporting tools for governments and donors (16).

1.2 Problem Statement

Despite the great interest in adopting EMR globally, there is a gap between the desired outcome and the actual implementation of EMR, especially in developing counties (17). Many developing countries are struggling to implement EMR systems.

In Rwanda, with the fiber optic network covering over 3,000 km across the country, almost all district hospitals precisely have fiber optic connection. Yet, as of 2016, it was estimated that only 40% of health facilities in Rwanda have installed OpenEMR (18–20).

In this study we assess the reasons of the relatively low implementation rate of the EMR across the country despite the widespread optic fiber set up which ordinarily could be the main limiting factor.

1.3 Study Objective

The general objective of this study was to examine the common EMR implementation challenges in Rwanda.

1.3.1 Specific Objectives

The specific objectives were to;

- Review literature to identify common implementation challenges of EMR worldwide.
- Conduct a health facility survey to examine user satisfaction and its relationship to system quality attributes, training levels and productivity impact.
- Propose recommendations to overcome these low implementation rate.

1.4 Significance of the study

Electronic health management system can simplify work process, transform the way care is provided to patients, and facilitate information availability (21).

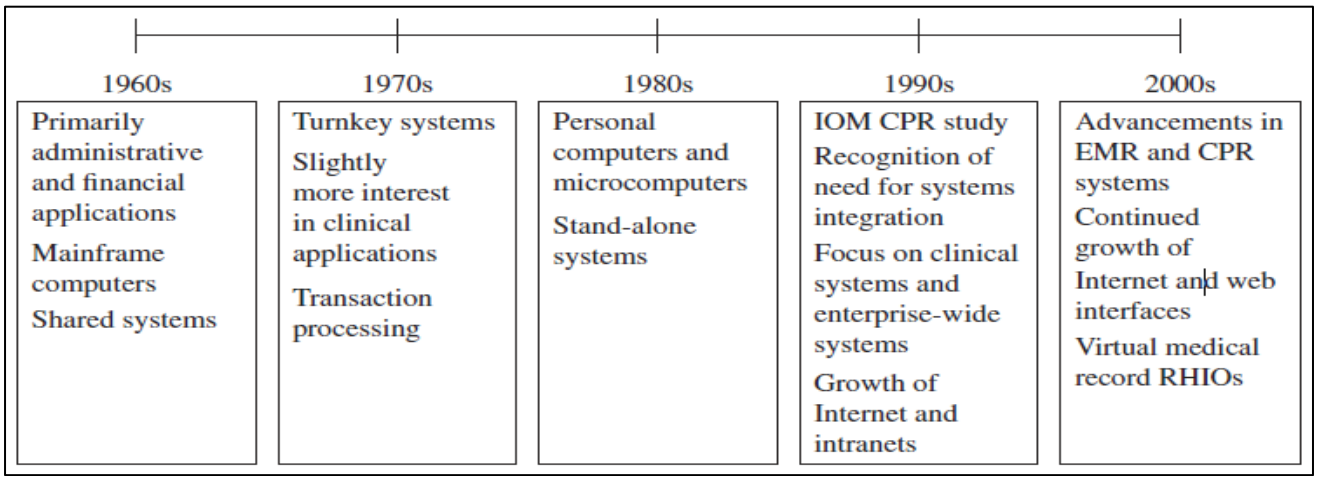
This study aims to provide suggestions for implementers and policy makers to overcome implementation challenges.

CHAPTER TWO: LITERATURE REVIEW

2.1 History of Health Information Systems

Early automated information systems (IS) could be traced back almost five decades ago in USA and Europe. Despite this long history, health record systems today are still predominately paper-based (22). The first computer systems used in healthcare dated to the early 1960s. Financial applications had been widely used in other industries at that time and it naturally became the first application for healthcare to adopt. A small number of hospitals in US began to develop in-house administrative and financial systems, primarily to perform payroll and patient accounting functions (23). The nature and scope of computer technology at that time was mainly restricted to supporting data-processing rather than more sophisticated information systems (24). By the 1970s, healthcare institutions were beginning to change their focus from maximizing revenues to minimizing expenses. Turnkey systems were available through vendor community and had increased interest in clinical applications. While financial application remained to be the focus, more progress was being made in the development of clinical systems (25). In 1980s, the development of personal computers enabled healthcare institutions to have more flexibility in the utilization of EMR. With the advent of market-driven healthcare reform, the growth of managed care, and the development of integrated delivery systems in the early 1990s, much more attention was devoted to the development of computer-based patient record (CPR) and clinical information systems (CISs) to collect and store patient care information. In 2000s, the widespread use of personal computers and the internet in developed countries began to change the way healthcare institutions delivered services and managed health-related information. The growth of the World Wide Web (www) and other internet technologies led to the development of easy-to-access healthcare information systems in many organizations (29). Figure 1 presents an overview of the evolution of healthcare HIS.

Figure 1: Evolution of Health Care Information System.



Source: AHIMA

2.1.1 Electronic Medical Records verses Electronic Health Record Systems

Although the terms "electronic medical record" (EMR) and "electronic health record" (EHR) are often used interchangeably; they however, have different meanings based on the situation and milieu (21).

EMR refers to a digital version of the traditional paper-based medical record for individual patient health information generated by one or more encounters in any care delivery setting; information may include patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports (26). On the other hand, EHRs focus on the total health of the patient-going beyond standard clinical data collected in the provider's office and inclusive of a broader view on a patient's care. EHRs are designed to reach out beyond the health facility that originally collects and compiles the information. They are built to share information with other health care providers, such as laboratories and specialists, so they contain information from all the clinicians involved in the patient's care. EHR allows Streamlined sharing of updated, real-time information, enables patient's medical information to move with them and accessing tools that providers can use for decision making like clinical decision support system (27).

2.2 Introduction to Electronic Medical Record Systems

Medical care is a complex process, there is great need for medical record to capture patient data that can then be processed and mined for insights to better treatment. As internet

connectivity becomes better, EMR emerges and shows promises to provide the needed platform (28).

In 1991, the Institute of Medicine (IOM) in US recommended that by 2000, every physician should be using computers in their practice to improve patient care and had made policy recommendations on how to achieve that goal (29). One of the recommendations was to develop a longitudinal patient record systems to capture information about the health of individuals throughout their lifetime. By late 1990s, the widespread use of personal computers and the internet in developed countries began to change the way healthcare institutions delivered services and managed health-related information. The growth of the World Wide Web (www) and other internet technologies led to the development of easy-to-access healthcare information systems in many organizations (30); ranging from simple web pages that provide consumers health information and the services provided by healthcare organizations to more sophisticated, interactive, web-based clinical information systems. Web interfaces have led to the development of virtual health records. With EMR, clinicians do not need the physical file to view or record patient data. Physicians can view patients' information brought together from different databases and data repositories on a single workstation virtually anywhere (31).

2.3 Evolution of EMR in Hospitals

Many hospitals in developed countries generally acquired administrative and financial systems first in order to track patient admissions and discharges and manage claims and reimbursement. Once administrative and finance were in place, other departments then gradually join the system, generally start with the "big three" - laboratory Information system (LIS), radiology information system (RIS), and pharmacy information system to support the majority of clinical processes (32).

Hospitals generally provided these through a portal that enables the physician to login to the hospital and view and/or download results. In some cases, the portals also enabled physician practices to enter data about their patients they were admitting, sign transcribed documents, and perform other chart completion activities (33).

As more data became available electronically, users grew frustrated with part of their data on paper and part electronic (a situation described as a hybrid record). They wanted to be able to make everything electronic, but knew it would take some time to acquire, implement, and

convince clinicians to adopt the core EHR applications. As a result, most hospitals adopted some form of document imaging. Some of these are very basic and others more complex. (34). Early in the evolution, document imaging management systems (DIMSs) and computer output to laser disk (COLD) systems were adopted. These would allow clinicians to continue documenting on paper, but would also make the paper documents more accessible. DIMS involve scanning documents created on paper and making their images available on a computer monitor. COLD systems capture print images of lab results and other documents that are in standalone electronic systems and make them available for viewing on a computer monitor. Because of the use of newer, magnetic storage media, COLD systems are more commonly referred to as electronic (or enterprise) report management (ERM) systems (35).
DIMS have become more sophisticated and today are called electronic document management systems (EDMSs). They can manage many types of digital documents, including e-mails and e-faxes. When EDMSs are well indexed, certain content within the documents can be uniquely retrieved. Electronic document/content management (ED/CM) systems, for example, may include barcoding on the forms to identify specific content, such as the name of the form (for example, nurse assessment, emergency services report) or part of a form, such as the section of a history and physical exam containing (35-38).

2.4 EMR Implementation versus Adoption

With the added benefits many hospitals are implementing EMR. However, the implementation by hospitals is different from adopting EMR by the organization.

2.4.1 Implementation

Implementation refers to a system having been installed and configured to meet a specific organization's needs (36). Implementation can be rolled out in phases to meet the needs of the hospitals. It is a period of time in which the organization is still working on some aspects of deployment before every user has become fully acclimated to the system and the changes in workflows and processes that accompany use of the EMR.

2.4.2 Adoption

Adoption refers to the state of EMR system where every intended user is using the basic functionality of the system. Adoption requires a period of acclimation for users to learn how to use the system and what further personal configuration may be desired (37). Although can be aided by the help of workflow and process analysts, adoption often mainly requires

individual acceptance of the changes. Adoption may also require retraining, reinforcement, further re-design of workflows and processes, and even a system of rewards (38).

2.5 Challenges of EMR Implementation and Adoption

Despite many government health reforms calling for EMR, the efforts to avail equitable technological infrastructure, and even peer pressure from developed countries, the implementation and adoption of EMR especially in LMICs remain challenging. Only a few literature investigated the use of EMRs by clinicians in sub-Saharan African countries (38–40). Among some of the concerns in EMR implementation included the underdevelopment of infrastructure, frequent power outages, network failure, discomfort among health workers with electronic medical records, the need for parallel paper and computer data entries which increased the work-load of already over-stretched staff, cost, uncertainty on the true benefits, workflow changes, questionable impact on productivity, unintended consequences, lack of ICT skills and education of users, the difficulty in maintenance of hardware, the limited application of software and the shortage of formal ICT companies providing support in many developing countries (42-44).

2.5.1 Cost of the System (EMR)

Cost is definitely a deterrence to acquiring EMRs. Studies have provided mixed evidences on cost of EMRs. The EMR helps provide better business intelligence to reduce cost. Most hospitals find some cost savings in administrative functions (clerical, admission, and billing) through EMR. Hospitals also generally find improvements in charge capture and reduction in the number of denied claims (45). Studies also showed 39.7% of hospitals reported decreased in total practice operating costs; including reduced transcription and clerical expenses, increased revenue from more accurate coding, better patient follow-up, saw more patients in a day, and improved revenue cycle management (32, 45).

However, there are also challenges associated with cost. An EMR system could cost between $350,000 and $2 million US dollars for a small hospital with fewer than 25 beds and up to $70 million US dollars in the larger hospitals in USA (27). The cost challenges has not been specifically studied for the LMIC. Even with the availability of free open source medical records systems, the cost of set-up and maintenance remains high.

EMR is a business cost for many private hospitals; the financial return on the investment remains uncertain. For example reduce repeat testing, use lower cost drugs, apply more cost-effective treatments, keep people out of acute care beds, and reduce readmissions could actually reduce revenue for a private hospital (47).

2.5.2 Workflow and Process Changes

EMR/EHR can change the sequence and process of a tasks. The impact of such changes could be positive or negative to the users (48). Physician can be very happy to sign the discharge summary at the convenience of their own laptop in their offices without physically going to the medical record department. On the other hand, physicians may not be as thrilled to see a Clinical Decision Support reminder about seasonal flu vaccination when trying to address the patient's chief complaint (49). It is very common that people assumed EMR is a magic bullet and forgot to address workflow changes.

An EMR is not an automated version of the paper health record. Instead, it is an automation of health information which may or may not reside in the paper format (50). Many hospitals attempted to replicate the paper system with EMRs; thinking that would help organizations adopt them better and only found that became a huge problem and resulted seeing little benefits (4). EMR should be used in new and improved ways to improve workflow and processes - a fact that many organizations have not fully embraced. However, the technology should not be the only factor to drive workflow and process. Changes should be customized to the needs of the clinicians and patients (51). While much is written about the need to address workflows and processes in an EMR environment, little concrete advice and assistance is available.

2.6 Productivity

Productivity refers to how effectively and efficiently people can perform their work (52). In hospitals, clinicians often find their productivity decreases as they are learning how to use the EMR. Almost all clinicians find the number of patients they can see in a day reduced; which in turn directly reduces their reimbursement. Although more comprehensive data were collected, the length of time needed to complete documentation in EMR was always longer than on paper (53).

Despite the initial reduction in productivity, study found after optimization, 41.1% of practices reported increased productivity, 42.4% reported productivity returned to normal, and only 16.5% reported reduced productivity (54). The study also found independent practices are more likely to have optimized their EMR than those owned by hospital; suggesting optimization is feasible and is a factor of motivation.

2.7 Unintended consequences

Scholars have compared EMR to the early use of seatbelts. In early days, seatbelts were only lap belts; while providing some desired safety improvements, they also caused new forms of injuries (55). Many unintended consequences (unanticipated and undesired effect) of EMR have been widely published since the mid-2000s included more or new work for clinicians, negative emotions, unfavorable workflow issues, generation of new kinds of errors, never ending system demands, unexpected changes in the power structure, problems related to paper persistence, overdependence on the technology, and untoward changes in communication patterns and practices (56).

2.8 Previous Work on EMR/EHR Implementation in sub-Saharan Africa

Many developing countries including Kenya, Ethiopia, Malawi and South Africa have shown significant progress of EMR implementations to support acute and chronic disease management. For example, the Academic Model for the Prevention and Treatment of HIV (AMPATH) Medical Record System (AMRS) was believed to the first sub-Saharan African EMR system used in the comprehensive management and clinical care of patients infected with HIV in western Kenya in 2001 (57). The system provided HIV/AIDS-specific information to support providers' decision making.

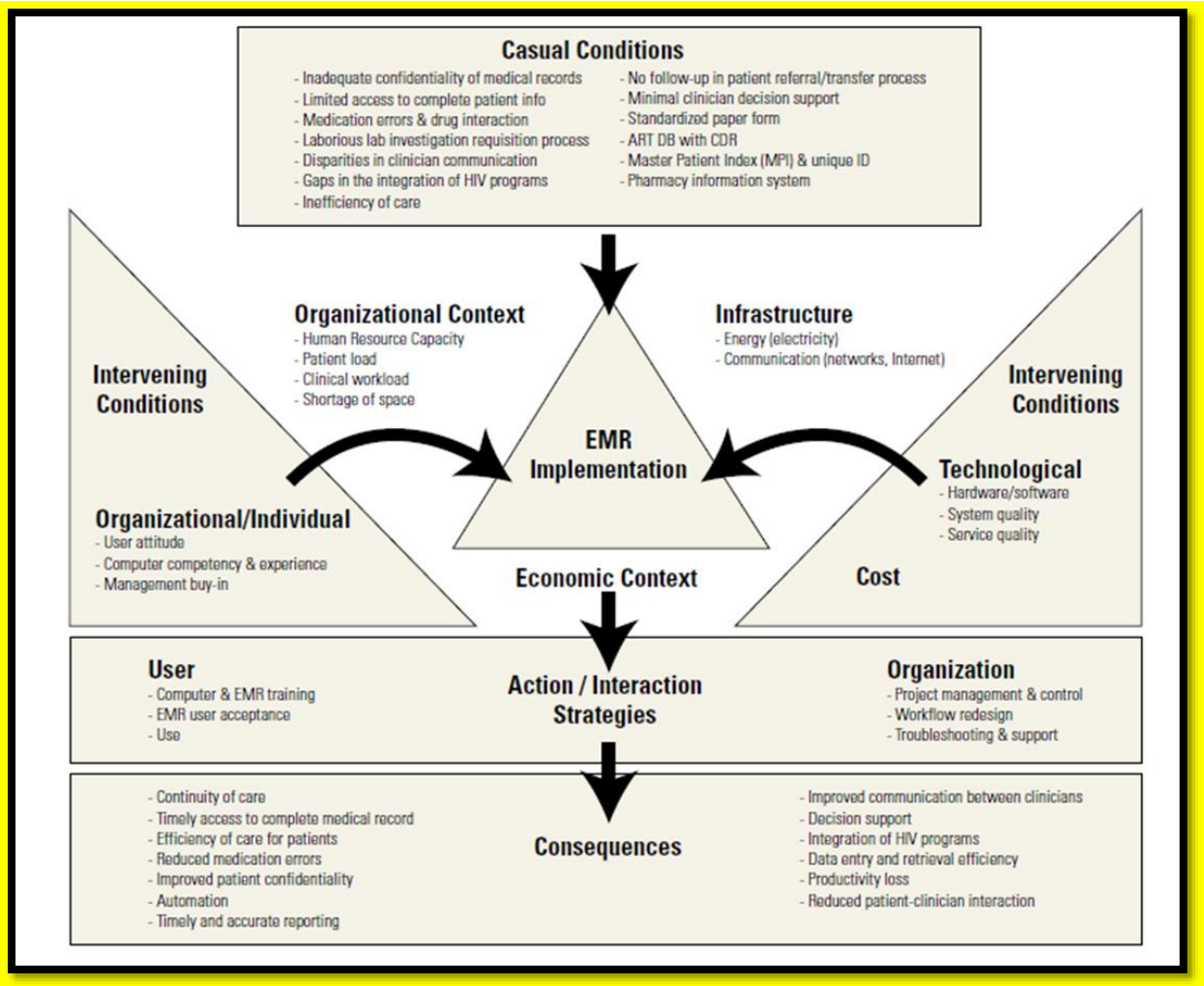
The Mosoriot Medical Records System (MMRS), comprises registration, data entry, reporting modules as well as a paper encounter form and a data dictionary, was piloted in Sub Sahara Africa, particularly in Kenya. The MMRS is an example of a financially and technically sustainable system; supporting 60,000 patients and over 150,000 visits within the four years since its implementation (58).

The deployment of a patient management information system (PMIS) with computer order entry (COE) in Lilongwe, Malawi reduced the number of errors in medication dosage calculation, completely eliminated the transcription of orders by nurses, and improved the

completeness and legibility of documentation accompanying specimens (59). The web-based medical record systems have been used mostly in management of HIV patients. Some rural clinics in Haiti also implemented EMR system to track patient clinical outcomes, laboratory tests and drug supplies.

Zambia and Ethiopia both use SmartCare EHR. SmartCare was Zambia's Ministry of Health (MoH) in collaboration with the Centers for Disease Control (CDC) initiation to nationally develop and deploy a scalable EMR system designed specifically for low resource and disconnected settings. It was deployed in over 800 health facilities in 94 districts by mid-2014 with over 250,000 patient enrollment (60). It was adopted by Ethiopia in 2007 as SmartCare-Ethiopia, with support from Tulane University Technical Assistance Project Ethiopia (TUTAPE) SmartCare supports longitudinal record-keeping for a variety of health issues such as HIV/AIDS treatments, TB care, VCT, and antenatal care. The system provides clinical decision support, touchscreen interaction, off-line data synchronization, and data portability via the use of smart cards. Additionally, the system provides complex data access through a large catalog of reports containing early warning indicators, treatment failure lists, and individual patient summaries (25). SmartCare, utilizes basic telecommunication infrastructure such as phone – ordinary Global System for Mobile Communications (GSM) or Code Division Multiple Access (CDMA) – and computer to send and receive reports and to update software in selected areas and hospitals. Figure 2 shows the recommended EMR implementation Framework for HIV Care and treatment facilities in Ethiopia (39).

Figure 2: Ethiopia Conceptual Frame work for EMR Implementation



Source: **An electronic Medical Record Implantation framework for HIV Care and treatment facilities in Ethiopia by Mikael Gebrie-Mariam et al.**

While generally, EMR was viewed as beneficial to the quality of health care provided, its implementation was met with challenges. Some of the difficulties in the implementation of EMR systems in developing countries include lack of back-up systems in the event of computer loss, poor system security leading to viruses and spyware, unstable power supplies and lack of battery back-up, lack of technical support inappropriate management of patient data, unreliable internet connections, lack of human resources (37).

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CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Study design

A cross sectional study was conducted to investigate the challenges of EMR implementation in 4 hospitals in Rwanda. A questionnaire was used to collect information about EMR users' system knowledge, satisfaction level and factors surrounding their satisfaction. The questionnaire was developed based on the results of literature review. The questionnaire had 3 sections. Section one collects basic demographic information of respondents. Section two contained 10-point Likert-scale questions asking respondents to indicate if they agree or disagree on the following ten statements: 1) The training of EMR is sufficient, 2) The EMR was time consuming to use, 3) Data entry is easy, 4) The navigation of the system is easy, 5) Generating report is easy, 6) Computer maintenance and Internet connectivity is excellent, 7) Current EMR system slows down work/decreases productivity, 8) I would prefer the EMR over manual paper based system, 9) I would recommend this EMR to other hospitals/users, and 10) It is important for hospitals to use EMR systems.

Section three included three open-ended questions:

1) What would you change about the current EMR system?

2) What is the most difficult part of the current EMR system?

3) What is the easiest part of the current EMR system?

This study was conducted between August and September 2016. Questionnaires were issued to respondents as researcher was present to explain complicated terminologies and also to offer clarity where possible.

3.2 Study population

The study population composed of the medical staff and non-medical staff who are working in health facilities where EMR system is being used.

3.3 Study procedure

Approval was obtained from the Institutional Review Board (IRB) of College of Medicine and Health Sciences (CMHS) for ethical clearance purposes. Permission was also sought

from Ministry of Health and the hospital administration to allow data collection from the 4 hospitals. These were Kacyiru, Masaka Kibagaba and Muhima Hospitals. Information was provided to all respondents about the objectives of the study, confidentiality was explained, and informed consents were obtained before the distribution of the questionnaires.

3.4 Sample inclusion and exclusion criteria

The target sample composed of nurses, physicians who are currently using EMR in their daily work. Hospital data managers, registration clerks, IT staff as well as hospital administrators were also included. Medical doctors, nurses, and hospital administrative staff who use EMR daily for the past 2 years were included in this study. Staff who had less than 2 years of work experience in the health facility were excluded.

3.5 Data management

Demographic and Likert scale information were entered into Epi data and exported to excel for data cleaning. Data completeness and quality was examined. Any outliers were identified and treated with individual consideration. After data cleaning, it was imported into SPSS v 17 for analysis. The responses from Likert-scale questions were grouped into disagree (1-5) and agree (6-10).

For the open-ended questions, common themes were identified by two independent researchers. The two researchers discussed, combined and created a final agreed list of themes with codes. Then the responses from the open-ended questions were coded and the frequency were counted by the researchers independently. The completed questionnaires were kept only for future reference and were locked away in a cabinet for confidentiality.

3.6 Data analysis

Descriptive statistics were used to present the demographics information, the frequency of occurrence for the responses of the Likert scale questions and the open-ended question after being coded. Binomial analysis was also conducted to identify the statistical significance in the Likert scale questions. Chi-tests were conducted to analyze correlations between variables. All data analyses were conducted using SPSS v.17, with P-value set at 0.05.

CHAPTER 4: RESULTS

4.1 Summary of demographics

A total of 64 health professionals participated in the survey. The allocation from difference health facilities was summarized in table 1:

Table 1: Summary of Health Facilities

Hospitals	No of Health Professional
Kacyiru Police Hospital	41 (64%)
Muhima Hospital	3 (4.7%)
Kibagabaga Hospital	7 (10.9%)
Masaka Hospital	13 (20.3%)
Total	64 (100%)

The sample included 9 (14%) physicians 25 (39%) nurses, 10 (16%) midwifes, 7 (11%) registration clerks, 5 (8%) lab attendants, 6 (9%) IT/data managers and 2 (3%) social workers (the table 2).

Table 2: Professional categories

N	64
Physicians	9 (14%)
Nurses	25 (39%)
Midwife	10 (16%)
Registration clerks	7 (11%)
Lab	5 (8%)
I.T/data managers	6(9%)
Social worker	2 (3%)

Out of the 64 samples, 28 were male (43.8%) while 36 were female (56.3%). The mean age was 32, with 25 (39.1%) within the age group of 21 – 29, 36 (56.3%) within the age group of 30– 39, and 3 (4.7%) within the age group of 40 – 49.

The mean years of work experience was 6.7 years, with 43.8% had worked less than 5 years, 46.9% had 5 to 10 years work experience, while 6.3% had 11 to 15 years , 1.6% had 16 to20 and 1.6% had more than 20 years working experience. On average, they had 5 years computer experience, 56.3% had 1-5 year's computer experience, and 28.1% had 6-10 years, 12 % had 11 to 20 computer experience. Out of all respondents, 2 (3.1%) reported themselves having expert level computer skills, 13 (20.3%) reported high level, 38 (59.4%) medium and 11 (17.2%) low (see table 3).

Table 3: Summary of sample demographics

N	64
Age (years)	
Mean (range)	32 (24 -48)
21-29	25 (39.1%)
30-39	36 (56.3%)
40-49	3 (4.7%)
Sex	
Male	28 (43.8%)
Female	36 (56.3%)
Work Experience (year)	
Mean (Range)	6.7 (2-35)
0-5	28 (43.8%)
6-10	30 (46.9%)
11-15	4 (6.3%)
16-20	1 (1.6%)
>20	1 (1.6%)
Computer Experience (year)	
Mean (Range)	5 (1-5)
No Experience	2(3.1%)
1-5	36 (56.3%)
6-10	18 (28.1%)
11-15	5 (7.8%)
16-20	3 (4.7%)
Computer Skills Level	
Expert	2 (3.1%)
High	13(20.3%)
Medium	38(59.4%)
Low	11(17.2%)

38 (59.4%) of respondents reported they have received EMR training while 26 (40.6%) did not. One respondent did not reply on this question. Among those who had received training, the mean number of hours of training was 16.8 hours, with 20 (52.6%) received below 20 hours training, 5 (13.2%) between 21 and 30, 6 (15.7%) between 31 and 40, and 7 (18.4%) 41 and above (table 4).

Table 4: EMR Training

N	64
Received Training	
Yes	38 (59.4%)
No	26 (40.6%)
Training received (hour)	
Mean (Range)	16.8 (0-95)
< 20	20 (31.2%)
21-40	5 (7.8%)
41-60	6 (9.4%)
>60	7 (11%)

4.2 Likert-scale questions

Of the 10 questions, 6 showed statistical significance. They are: 1) 41 (64%) respondents said the training EMR was insufficient, P= 0.033; 2) 51 (80%) respondents agreed data entry is easy, P<0.001; 3) 44 (69%) respondents agreed navigation of the system is easy, P=0.004; 4) 52 (81%) respondents would prefer the EMR over manual paper based system, P<0.001; 5) 57 (89%) respondents would recommend this EMR to other hospitals/users, P<0.001; and 6) All 64 (100%) respondents agreed it is important for hospitals to use EMR systems, P<0.001. The results are summarized in the Table 5 below.

Table 5: Summary of results of survey

Survey Questions	Disagree	Agree	P Value
	N		
The training of EMR is sufficient	41 (64%)	23 (36%)	0.033*
The EMR was time consuming to use	31 (48%)	33 (52%)	0.901
Data Entry is easy	13 (20%)	51 (80%)	<0.001*
The navigation of the system is easy	20 (31%)	44 (69%)	0.004*
Generating report is easy	28 (44%)	36 (56%)	0.382
Computer Maintenance and Internet connectivity is excellent	26 (41%)	38 (59%)	0.169
Current EMR system slows down work/decreases productivity	28 (44%)	36 (56%)	0.382
I would prefer the EMR over manual paper based system	12 (19%)	52 (81%)	<0.001*
I would recommend this EMR to other hospitals/users	7 (11%)	57 (89%)	<0.001*
It is important for hospitals to use EMR systems	0 (0%)	64 (100%)	<0.001*

* Statistical significant at P<0.05

Among the 6 items showed statistical significance, results were further breakdown into professional groups and their experience on training and computer were summarized in table6

Table 6: Summary of Profession vs. Training and Computer

	Physician	Nurses	Midwife	Register	Lab	IT/data manager	Social worker
The training of EMR is sufficient	44%	40%	30%	14%	40%	33%	50%
Data Entry is easy	100%	80%	60%	100%	60%	83%	50%
The navigation of the system is easy	89%	64%	50%	71%	80%	83%	50%
Prefer the EMR over manual paper based system	78%	80%	80%	100%	40%	100%	100%
Would recommend this EMR to other hospitals/users	100%	88%	70%	100%	80%	100%	100%
Find important for hospitals to use EMR systems	100%	100%	100%	100%	100%	100%	100%
Training on EMR (Hour)	1.2	19	6	44	3	34	2
Computer experience (years)	9	3.9	3.7	2.8	7.4	10	5.5
Work experience (years)	9	7.5	5	4.5	6.8	4.1	9

100% of the physicians and the registration clerks, 83% of data managers/IT, 80% of nurses, and 60% of the lab attendants and midwifes felt that data entry is easy. 88.9% of the physicians, 80% of lab, 75% registration clerks, 64% of nurses, 50% of midwifes felt that it is easy to navigate the system

The results showed 100% the registration clerks and IT/Data managers and social workers; 80% of nurses and midwives, 78% physicians, and 40% of lab attendants preferred the EMR over a paper based system

All the physicians, registration clerks and IT/Data managers and social workers would recommend the system to other health facilities. While 88% of the nurses 80% lab attendants, and 60% of the midwives would recommend the system to other health facilities.

All respondents (100%) agreed that use of the EMR system is important in hospitals.

Registration clerks received the highest number of EMR training hours (44 hours) followed by IT/data managers (34 hours). Nurses had 19 hours; while physicians had 1.2 hours of EMR training.

IT/Data managers had on average 10 years' experience of using computer followed by Physician with 9 years, laboratory technician 7.4, social workers 5.5, and registration clerks had the lowest - 2.8 years.

4.3 Open-ended questions

The top 4 responses of each of the open ended questions were summarized in table 7.

Table 7: Summary of Open Ended Questions

Easiest		Most difficult		Change	
Check data/result	19 (29.7%)	Reporting	21 (38.2%)	More functionality	24 (44%)
Find patient	14 (21.9%)	Support	11 (20%)	Reporting	11(20%)
Registration	12 (18.8%)	Billing	14 (25.5%)	Training	10 (18%)
Data Entry	11 (17.2%)	Registration	5 (9.1%)	Data Entry	5 (9%)

For the question" What would you change about the current EMR system" respondent had top three most frequent responses were 1) 24 (44%) to increase functionality added to the system, 2) 11 (20%) about changing the reporting function, and 3) 10 (18%) about more training is needed on system (table 7).

For the most difficult Part of the current EMR system, the top three most frequent responses were: 1) 21 (38%) reporting, 2) 11 (20%) general system support, and 3) 14 (25.5%) billing (table 7).

For the easiest areas of the system, the top three most frequent responses were: 1) 19 (29.7%) check data/results, 2) 14 (21.9%) find patients and 3) 11 (17.2%) data entry (table 7).

Chi square tests were conducted to analyze if the profession and number of EMR training hours would associate with their preference and recommendation of EMR, the analyses showed no statistical differences in term of profession and EMR training to their preference (table 8).

Table 8: Summary of EMR Preference and Recommendation

Factors	Decision	P value
Profession	Recommend EMR to other hospitals/users	0.309
	Prefer the EMR over manual paper based system	0.165
No of hours trained on EMR	Recommend EMR to other hospitals/users	0.768
	Prefer the EMR over manual paper based system	0.397

CHAPTER 5: DISCUSSION

5.1 Key Findings

Our results showed that most of the respondents have worked 6 - 10 years, while most of them only have 1 – 5 years of computer experience, indicating many of the respondents have some time during their career that they did not use computer at work. While naturally IT/data managers have the most computer experience, physicians have the second most computer experience among all disciplines; while registration staff and midwives had the least experience in using computer.

The results showed that most respondents were in favor of using EMR. 100% of them said it is important for hospitals to use EMR systems, and significant of them preferred the EMR over manual pap based systems and would recommend EMR to other users. This results indicated in general users have positive attitude towards EMR, regardless their professional category or the amount of EMR training they have received.

Another significant finding was the majority of respondents found the EMR training insufficient. That was also reflected in the open-ended question portion of the questionnaire. One of the top 3 suggestions to improve the EMR system from the respondents was provide more training.

Despite the training was universally seen as insufficient, significant proportion of respondents said the data entry and navigation were easy. When further broke down into professional groups, we found physicians, registration, IT/data management, and nurses mostly found they system easy to use. While midwives, laboratory, and social workers found the system less easy to use.

Most IT/data manager and registration staff found both data entry and navigation easy, that is probably due to two reasons: 1) they received the highest number of hours of EMR training and 2) they nature of their jobs requires them to do a lot of data entry and navigation; as a results they were more familiar with the system. It is also logical and safe to assume IT/data managers are incline to favor computer over paper system due to the extent of their training,

the nature of their work and the amount of computer experience they have. Physicians found the system easy to use despite they had received the least number of hours of EMR training, it is probably because physicians also had the most computer experiences among all other professional groups except IT/data manager. The experience on using computer made it easy for them to use the system. Midwives and social workers were less incline to say the system was easy to use; probably due to the insufficient EMR trainings as well as their generally lack of computer experience.

While data entry and navigation are two intrigue features of EMR, another important component of EMR is to generate reports. Our survey results showed mixed opinions on the easiness of report generating; which is consistent with the open-ended questions. Report generation was listed at the most difficulty feature of EMR, and improving reporting was the second most frequent requests to change the EMR.

With the deployment of new technology, it is expected that many changes in work processes would increase productivity. The results also showed mixed opinions on EMR in terms of it being time consuming, productivity or slowing down efficiency, which is consistent with other previously published research (41-45, 51-53). Two of the most difficult features of the current EMR were reporting and billing; both are crucial functions of hospital operations. The most frequently requested change was to include more functions in the current EMR; we suspect the current billing and reporting functions of EMR are not sufficient to meet the needs of users. With the modifications to enhance the system and more trainings to ensure competence and skills of users, the efficiency and productivity could probably increase. However, further investigation is needed to identify the actual need and exact features respondents desired.

Despite the fiber optic network covering over 3,000 km across Rwanda (18–20), the internet connectivity was perceived with mixed reviews. Similar review was seen in computer maintenance. Further study is needed to obtain objective information on these items.

It is also worth mentioning that laboratory staff was the only discipline that did not prefer EMR over paper based system. Further investigation is needed to identify the root cause of

such result. We speculate this could be related to the functionality of the EMR system pertinent to laboratory functions. Since the key functions needed by laboratory on EMR are data entry and report generation – only 60% of laboratory staff reported data entry was easy and reporting overall was not perceived as easy – we suspect these two key functions could affect the laboratory staff preference.

5.2 Limitations of the study

This study had several limitations. Our study only included a sample of 4 hospitals in Kigali Urban districts. The findings may not be generalized to the whole county, since rural hospital settings could have significant difference in infrastructure, staffing pattern, and skill mix. The sample size of this study could be larger in order to be more representative.

This study was conducted in Rwanda; the findings may or may not be generalizable to other low and middle-income countries in sub-Sahara Africa.

Although the four hospitals selected all have EMR implemented, their implementation stages could be different. It is possible that one hospital has been implementing much longer than another hospitals, thus the staff exposure to the system could be different, and in turn, the results from the respondents could be different. This study only assessed the responses from user's perspective, the institutional challenges including cost or staffing pattern were not included.

Our study utilized a questionnaire to collect data. The survey participants were assured anonymity; however, that does not guarantee complete reliability in answering the questionnaires.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Summary

EMR implementation is still at its infantry stage in Rwanda public health care system. This study aimed at examining the common EMR implementation challenges in four Rwandan government district hospitals. We conducted a health facility survey to examine user satisfaction and its relationship to system quality attributes, training levels and productivity.

This study set out to examine the challenges of implementing an EMR system within health facilities in Rwanda. Successful implementation of EMR program goes beyond simply purchasing a reasonably functional technology package. It is important to understand the challenges that come along during implementation and incorporate users' feedback to enhance the system as well as implementation methodology. The study utilized a questionnaire to collect information from EMR users, and included various clinical and non-clinical staff who had used EMR in the past two years. Information collected were analyzed to identify the success and challenges affecting the users' satisfaction. Information collected include users' professional experience, computer experience, system navigability, ease of use, impact of EMR on productivity, their willingness to recommend the system to other health facilities. Open-ended questions were used to collect user's opinion on how to improve the system.

6.2 Key conclusions

The results and feedback from this study offers interesting insights. Overall, there is positive attitude about the contribution EMR system makes. It is evident that insufficient training was still a major implementation gap. Not only a significant portion of users did not receive any EMR training, among the ones who had, the majority only had less than 20 hours training. Most respondents requested to add or enhance the functions to the EMR system, possibly include report generation and billing; which could probably increase the productivity too. It is important to customize the EMR functions to meet the needs of individual departments, for example, laboratory has its own unique needs in functions and should be catered to.

Although there are some challenges in the implementation of EMR, it is important to continue to use EMR, as supported by the view of respondents. The findings indicate that

usage and user satisfaction is largely influenced by perceived usefulness. Equally, ease of use and productivity can have a strong effect on the way users view and rate enabling technologies. It is also important to improve the internet connectivity and maintenance services to allow clinicians and other remote user's reliable access.

6.3 Recommendations

Based on the findings of this study, the following recommendations were provided:

6.3.1 Training

There are areas within the system which the users still find difficult to use. More importantly, there are many users who never got the opportunity to be trained in the EMR. It is thus important that a comprehensive training program be established and provided to all users. To maximize the effectiveness, training materials should be accessible in both Kinyarwanda and English.

6.3.2 Technical support

Effort should be provided to maintain and support EMR implementation on ongoing basis, particularly when the system goes down. It will be beneficial to establish a central help desk that can support the implementation to streamline the support process.

6.3.3 Adopting best practice in EMR implementation

Many countries have adopted EMR implementations. It could be beneficial to adopt an evidence-based best implementation practice from other similar programs that was proven successful. For example, Ethiopia developed an implementation framework for using the EMR for managing HIV care and treatment. While not the whole framework is applicable to Rwanda environment, we have found this framework interesting and some of the ideas can potentially be adopted.

6.3.4 Other studies

This study only undertook the study on a small aspect of EMR implementation. It is important to continue similar study to include more hospitals and more samples as EMR rolls out to more hospitals. As more hospitals and their staff are exposed to EMR, additional investigation will be required to quantify any resulting change in attitudes.

Other important areas of EMR worth studying include cost, efficiency, accuracy, and data quality.

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APPENDICES

Appendix 1. Questionnaire

Age_____ Gender □Male □Female Work experience (years)_____

Computer experience (years)_____ Computer skill level □ Expert □ high □ medium □ low

Profession □ Physician □ Nurse □ Midwife □ Registration
□ Lab □ IT/data manager □ Social worker □ Others _____

Did you receive EMR system training □ Yes, if yes How many Hrs. of training on EMR_____
□ No

Questions

	Strong disagree Strongly agree
The training of EMR is sufficient	□ 1 □2 □ 3 □4 □5 □6 □7 □8 □9 □10
The EMR was time consuming to use	□ 1 □2 □ 3 □4 □5 □6 □7 □8 □9 □10
Data entry is easy	□ 1 □2 □ 3 □4 □5 □6 □7 □8 □9 □10
The navigation of the system is easy	□ 1 □2 □ 3 □4 □5 □6 □7 □8 □9 □10
Generating report is easy	□ 1 □2 □ 3 □4 □5 □6 □7 □8 □9 □10
Computer maintenance and Internet connectivity is excellent	□ 1 □2 □ 3 □4 □5 □6 □7 □8 □9 □10
Current EMR system slows down work/decreases productivity	□ 1 □2 □ 3 □4 □5 □6 □7 □8 □9 □10
I would prefer the EMR over manual paper based system	□ 1 □2 □ 3 □4 □5 □6 □7 □8 □9 □10
I would recommend this EMR to other hospitals/users	□ 1 □2 □ 3 □4 □5 □6 □7 □8 □9 □10
It is important for hospitals to use EMR systems	□ 1 □2 □ 3 □4 □5 □6 □7 □8 □9 □10

Open ended questions:

What would you change about the current EMR system?
What is the most difficult Part of the current EMR system?
What is the easiest part of the current EMR system?

Appendix 2. Consent form

Title of Study: A case study to investigate the challenges on EMR implementation in four district hospitals in Rwanda.

Investigators: Mutabazi Boney, University of Rwanda College of Medicine and Health Sciences .School of Public Health, Department of Health Informatics.

Introduction

You are being asked to be in a research study of assessing challenges on EMR implementation in four district hospitals in Rwanda and you were selected as a possible participant because;-

- You have more than 2 years' experience working in District Hospital using EMR
- We have been referred to you by a colleague of yours [former or current]

We ask that you to read this form and ask any questions that you may have before agreeing to be in the study. If you agree to be in this study, you will be asked to do the following things:-

- Answer the questionnaire and other questions outside the questionnaire but related to the EMR implementation in your hospital.
- Provide information related to the implementation, the discomforts in relation to the benefits you have accomplished for the time you have been using EMR in your hospital.

It will take approximately 20 min of you time and refer me the next best alternative who could offer same information.

Confidentiality; the study is anonymous. We will not be collecting or retaining any information about your identity.

Right to Refuse or Withdraw

The decision to participate in this study is entirely up to you. You may refuse to take part in the study at any time without affecting your relationship with the investigators of this study. You have the right not to answer any single question, as well as to withdraw completely from the interview at any point during the process; additionally, you have the right to request that the interviewer not use any of your interview material.

Right to Ask Questions and Report Concerns

You have the right to ask questions about this research study feel free to contact Boney Mutabazi +250781 575215 the Principle Investigator or Professor Kato J. Njunwa Chairperson Institutional Review Board or Prof Gahutu Jean and Dr. Brenda Kateera at the Secretariat Institutional Review Board

Consent

Your signature below indicates that you have decided to volunteer as a research participant for this study, and that you have read and understood the information provided above. You will be given a signed and dated copy of this form to keep, along with any other printed materials deemed necessary by the study investigators.

Name (print): Signature: Date:

Appendix 3. FHI-RET Certificate

fhi360
THE SCIENCE OF IMPROVING LIVES



FHI 360

certifies that

Mutabazi Boney

has completed the

RESEARCH ETHICS TRAINING CURRICULUM

January 25, 2016

Appendix 4. Dean's Recommendation

UNIVERSITY OF RWANDA

COLLEGE OF MEDICINE AND HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH

OFFICE OF THE DEAN/SPH

RECOMMENDATION

This is to testify that **Mr Boney MUTABAZI** with Registration Number **216334888** is the finalist student in the Masters of Science in Health informatics at University of Rwanda , College of Medicine and Health Sciences, School of Public Health. During the academic year 2015-2016, the Student will be doing research for final thesis titled: **CHALLENGES OF IMPLEMENTING ELECTRONIC MEDICAL RECORDS SYSTEM (EMR)IN RWANDA DISTRICT HOSPITALS "CASE OF KACYIRU, KIBAGABAGA, MASAKA AND MUHIMA HOSPITALS"**

Any assistance rendered to him will be highly appreciated

Yours Sincerely'

Dr. UMUBYEYI Aline
Acting Dean SPH

EMAIL: infosph@nsph.org P.O. Box: 5229kigali WEBSITE: www.ur.ac.rw

Appendix 5. IRB /CMHS Ethical Clearance

UNIVERSITY OF RWANDA

COLLEGE OF MEDICINE AND HEALTH SCIENCES

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 7th June/2016

Bony Mutabazi
School of Public Health, CMHS, UR.

Approval Notice: No 252 /CMHS IRB/2016

Your Project title ***"Challenges Of Implementing Electronic Medical Records Systems (EMR) In Rwanda's District Hospitals: Case Of Masaka, Muhima, Kibagabaga And Kacyiru District Hospitals"*** has been evaluated by CMHS Institutional Review Board.

		Involved in the decision		
		Yes	No (Reason)	
Name of Members	**Institute**		**Absent**	**Withdrawn from the proceeding**
Prof Kato J. Njunwa	UR-CMHS		X	
Prof Jean Bosco Gahutu	UR-CMHS	X		
Dr Brenda Asiimwe-Kateera	UR-CMHS	X		
Prof Ntaganira Joseph	UR-CMHS		X	
Dr Tumusiime K. David	UR-CMHS	X		
Dr Kayonga N. Egide	UR-CMHS		X	
Mr Kanyoni Maurice	UR-CMHS	X		
Prof Munyanshongore Cyprien	UR-CMHS	X		
Mrs Ruzindana Landrine	Kicukiro district		X	
Dr Gishoma Darius	UR-CMHS	X		
Dr Donatilla Mukamana	UR-CMHS	X		
Prof Kyamanywa Patrick	UR-CMHS		X	
Prof Condo Umutesi Jeannine	UR-CMHS		X	
Dr Nyirazinyoye Laetitia	UR-CMHS		X	
Dr Nkeramihigo Emmanuel	UR-CMHS		X	
Sr Maliboli Marie Josee	CHUK	X		
Dr Mudenge Charles	Centre Psycho-Social	X		

After reviewing your protocol during the IRB meeting of where quorum was met and revisions made on the advice of the CMHS IRB submitted on 6th June2016, **Approval letter has been granted to your study.**

EMAIL: *researchcenter@ur.ac.rw* P.O. Box: 3286, Kigali, Rwanda WEBSITE: http://cmhs.ur.ac.rw/

Please note that approval of the protocol and consent form is valid for **12 months**.
You are responsible for fulfilling the following requirements:

1. Changes, amendments, and addenda to the protocol or consent form must be submitted to the committee for review and approval, prior to activation of the changes.
2. Only approved consent forms are to be used in the enrolment of participants.
3. All consent forms signed by subjects should be retained on file. The IRB may conduct audits of all study records, and consent documentation may be part of such audits.
4. A continuing review application must be submitted to the IRB in a timely fashion and before expiry of this approval
5. Failure to submit a continuing review application will result in termination of the study
6. Notify the IRB committee once the study is finished

Sincerely,

Date of Approval: The 7th June 2016
Expiration date: The 7th June 2017

Professor Kato J. NJUNWA
Chairperson Institutional Review Board,
College of Medicine and Health Sciences, UR

Cc:
- Principal College of Medicine and Health Sciences, UR
- University Director of Research and Postgraduate studies, UR

Appendix 6. Ministry of Health Research Authorization

REPUBLIC OF RWANDA

Kigali, on 05 JUL 2016
N° 20/3163 /DGPHFIS / MPP/2016

MINISTRY OF HEALTH
P.O .BOX: 84 KIGALI
www.moh.gov.rw

Mutabazi Boney
Principal Investigator

Re: Authorization of research

Reference is made to your letter dated 9 June 2016 requesting authorization to conduct a research entitled: "**Challenges of Implementing Electronic Medical records systems in Rwanda District Hospitals(EMR), Case of Masaka, Muhima, Kibagabaga and Kacyiru District Hospitals**";

Based on Rwandan Health Sector Research Policy and approval from CMHS Institutional review board with Ref No: 252/CMHS IRB/2016 dated June 7, 2016;

I am pleased to inform you that the Ministry of Health has granted authorization to conduct this research and to collect data according to the approved protocol.

You are requested to share the results with the Ministry of Health and to provide the final report and datasets to the Ministry.

Sincerely,

MINISTERE DE LA SANTE

Dr. Agnès BINAGWAHO
Minister of Health
Cc:

- Dean of School of Health Sciences/UR/CMHS
- Director of Masaka Hospital
- Director of Muhima Hospital
- Director of Kibagabaga Hospital
- Director of Kacyiru Hospital

Appendix 7. Muhima Hospital Data Collection Authorization

REPUBLIQUE DU RWANDA

VILLE DE KIGALI
DISTRICT DE NYARUGENGE
HOPITAL DE MUHIMA
B.P : 2456 KIGALI
Tél. /Fax : +252 50 37 7
E-mail : muhimahospital1@gmail.com

ETHICS COMMITTEE/ COMMITTEE D'ETHIQUE

11th July 2016 Ref: MDH/EC/……/2016

Review Approval Notice

Dear Boney MUTABAZI

Re: Your request for data collection at Muhima hospital.

During the meeting of ethic committee of Muhima District Hospital that was held on 11th July 2016 to evaluate your demand we are please to inform you that the Muhima Hospital Ethic Committee has approved your request.

You are required to submit progress report(s) regularly as dictated by your proposal. Furthermore, you must notify the committee of any proposal change(s) or amendment(s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. The committee expects to receive a final report at the end of the study.

Yours sincerely,

Dr BUTERA Yvan

Chair Person, Ethics Committee

MUHIMA HOSPITAL - ETHIC COMMITTEE -

Approved

Appendix 8. Masaka Hospital Data Collection Authorization

REPUBLIC OF RWANDA

Masaka on 20/7/2016
REF: 631/MSK/DH/2016

KIGALI CITY
DISTRICT KICUKIRO
HOPITAL MASAKA
B.P 3472 KIGALI
E-mail: masaka.hospital@moh.gov.rw

To the Mutabazi Boney
University of Rwanda CMHS
School of public Health
Email: bmutabazi@gmail .com

Re: Response to your request

Dear Sir,

Refering to the letter written on 24th June 2016 requesting authorization to conduct data collection for a school research study "**Challenge of Implementation Electronics Medical Records System" (EMR)**. The management of Masaka District Hospital is pleased to inform you that, your request is accepted .

Sincerely

Dr.Marcel UWIZEYE
Masaka Hospital acting Director

Cc:-Dean .UR-CHMS-School of Public Health
-Chairperson . UR-CHMS-Institutional Review Board

Appendix 9. Caritas de la' archdiocese de Kigali Collection Authorization

CARITAS
KIGALI

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; Web : www.caritas-cdjp-kigali.rw

Kigali, le 02/08/2016

Objet : Permission

Chères titulaire de des Centres de santé de MASAKA, KABUGA, KICUKIRO et GIKONDO

Chères titulaires,

Je vous adresse cette lettre pour vous demander de faciliter le travail de recherche académique pour Mr MUTABAZI Boney de l'Université du Rwanda CMHS sur le thème « Challenge of implementation electronics Medical Records System in Rwanda's District Hospitals : Case study of Masaka, muima,Kibagabaga and Kacyiru District Hospitals».

Espérant une réception fraternelle à son égard, je vous assure notre franche collaboration.

A.Donatien TWIZEYUMUREMYI

Directeur de la Caritas de Kigali

DIOCESAINE DE KIGALI
DIRECTION
Caritas-Kigali
B.P.3378 KIGALI