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Regional Centre of Excellence in
Biomedical Engineering and E-Health

Evaluation of Electronic Medical Record effectiveness on continuity of patient care in health facilities

Case of chronic diseases treated at Kiziguro District Hospital

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Regional Centre of Excellence in Biomedical Engineering and E-Health

Master in Health Informatics



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By

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**Research proposal submitted to University of Rwanda as part of the
dissertation in partial fulfillment for the award of Master's Degree in Health
Informatics.**

August 2023

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DECLARATION

I hereby declare that, except where otherwise indicated, this document is entirely my own work and has not been submitted in whole or in part to any other university.

Name: BAGARAGAZA Aimable

Signature:

Date: August 25th, 2023

CERTIFICATION

This is to certify that this research work “*Evaluation of Electronic Medical Record effectiveness on continuity of patient care in health facilities*” is an original work, verified via antiplagiarism system and found compliant, proposed and conducted by Mr. BAGARAGAZA Aimable as a result of his academic effort, and was done under my supervision.



Dr NASIRU Sani

Date: August 25th, 2023



Ms. MUREREREHE Juliennes

Date: August 25th, 2023

DEDICATION

I dedicate this work to Jehovah God

To my wife Mrs. KUBWIMANA Vestine

To my children: MUGISHA Romeo Aimable, INEZA Belinda Kennice and ISHEMA NEZA Eunice

To my colleagues

To my friends and relatives

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ABSTRACT

Background: Rwandan hospitals have been using information technology to manage medical files (EMRs) since 2006, and common types of EMRs that are used in Rwanda are Open MRS and Open Clinic. EMRs are believed to help healthcare providers to communicate with each other while practicing their job and ensure the continuity of care by avoiding fragmentation of care. Researches about continuity of care through EMR use were carried out elsewhere, but not in Rwanda. **Aim:** the project aimed to assess how electronic medical records system enhances continuity of care for patients, through the implementation of a single medical file for each patient in healthcare facilities.

Method: The cross-sectional study design was used. During data collection, information was gathered from patients with chronic illnesses about their hospital experience on multiple occasions the came for healthcare; and from members of staff who were receiving/consulting patients at the time of data collection regarding their experience while using EMR/OpenMRS for patients who visited the hospital on multiple occasions for healthcare. The data was analyzed using descriptive statistics and Chi-square tests.

Results: One hundred nineteen (89%) patients reported a positive experience with the way healthcare providers work together using stored health information in EMR from different departments ($p\text{-value}=0.03$). Regarding continuity of care 115 (86%) of patients reported that their healthcare providers passed on information to each other very well and it was statistically significant in relation to the number of departments that patients had visited ($p\text{-value}=0.03$). Furthermore, regarding EMR implementation, 23 (68%) staff members reported that every patient was given his unique ID number; 17 (50%) of staff reported that sometimes they treated the patient with same ID number (the same as the one s/he used last time) and 25 (74%) staff reported that they checked patients' medical history and used it at each time s/he came to see them.

Conclusion:

The findings of the current research project indicated that information stored in EMR was utilized every time patients came to see the healthcare provider. In addition, results showed that

the healthcare providers communicated with each other through EMR while practicing their job, therefore ensuring the continuity of care and avoided fragmentation of care. Lastly, the level of EMR was implemented by the health facility and routinely used by majority of staff. This shows that patients' care was improved by the use of EMR and therefore patients may be satisfied by the way they were care for.

Key words: continuity of care, electronic medical records (EMR), one medical patient's file

LIST OF ABBREVIATIONS

AIDS: Acquired Immune Deficiency Syndrome

CEO: Chief Executive Officer

Dr.: Doctor

EMR: Electronic Medical Record

HIV/ART: Human Immune deficiency Virus/ Anti retro viral therapy

ID: Identification

ICT: Information Communication Technology

MOH: Ministry of Health

Ms.: Marital-status neutral

MS: Microsoft

Mr.: Mister

OpenMRS: Open Medical Records System

RBC: Rwanda Biomedical Center

SPSS: Statistical Package for the Social Sciences

TB: Tuberculosis

UR-CMHS: University of Rwanda- College of Medicine and Health Sciences

WHO: World Health Organization

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DEFINITION OF KEY TERMS

Electronic Medical Record (EMR) system: in this study, EMR is referred to as a digital version of a paper-based patient's medical file.

Patient's ID number: in this study, patient's ID number is referred to as a unique system generated number which identifies a patient and distinguish him/her from the rest of other patients.

Chronic disease: a health condition which is not passed from person to person which is for long duration and generally slow progression(1).

Continuity of patient care: For the purpose of this study, continuity of patient care is defined as a coherent healthcare with a seamless transition over time between various providers in different services/ departments (2).

CHAPTER 1: INTRODUCTION

1.1. Background

Rwandan hospitals have been using information technology to manage medical files (EMRs) since 2006 (3), and common types of EMRs that are used in Rwanda are Open MRS and Open Clinic.

Electronic Medical Records are system whereby patient's information is stored digitally in a computer, stored locally within the same healthcare facility and it is not shared to other health facilities or institutions (4). Globally, while comparing the advantages of Electronic Medical Records (EMR) and hard medical records copies, it was demonstrated that EMR use enhances healthcare delivery in healthcare (5). This may be due to the fact that paper based medical records systems are associated with bad handwriting of healthcare providers. This therefore results into inevitable medical errors which result into poor service delivery and patients' dissatisfaction, difficulties with management of large archives of patients' files and incident-associated risks of losing paper based patients' files (for instance in case of fire). In sub-Saharan Africa where the country of Rwanda is located, it was reported that the region lags behind in terms of using information communication technology which was proven to be very important to enhance quality patients care yet, the use of health information technology includes administrative application (with own income generation strategies) among others (6). In contrast, Electronic Health Records is an important aspect of medical information communication technology being used to improve healthcare (7).

Electronic Medical records systems ensure better documentation whereby needed health information can easily be re-used than the paper based medical record system (8). Quality documentation and reliable data is a key factor in own income generation both from direct payment by patients and from reimbursement by health insurance companies because risk of the billing staff to leave out the billing process or erroneously entering fewer units is avoided through the enhancement of accuracy (9). Therefore, healthcare facility own income may be affected by loss of some services during billing (the billing staff may willingly leave out the billing process or may erroneously enter fewer units which in return results into lower billing and hence lower reimbursement).

In addition, the risk of healthcare facilities often having poor support documents due to errors, omissions or illegible handwriting to submit to health insurance companies for reimbursement is minimized or avoided (9). Furthermore, the risk of healthcare providers spending significant time during hand writing or documentation (writing and reviewing the written notes) is also avoided. Healthcare facilities need to trust in investing in EMR basing on reliable information and healthcare providers need to be motivated for the proper use of EMR in order to help their institution increase own revenues. With all the patients' information and data being stored in one location which is EMR, service efficacy and improved healthcare can be guaranteed and ensured by using stored patients histories and previous clinical summaries (10).

Electronic medical records use is associated with quality services whereby satisfaction, access of information etc. can be ensured (11). According to WHO report, as of 2011, 114 countries have been working on national EMR systems (12).

Timely health information is the cornerstone of quality healthcare (13), and usually, patients need readmission in healthcare facilities (14) which indicates the importance of maintaining and sharing patients' information at each visit. When communication and information sharing is not properly done, patient's care can be negatively affected (15). Therefore, effective and timely sharing of patients' data regarding diagnosis, history and investigation may improve continuity of their healthcare (15). In healthcare facilities, through continuity of care, electronic medical records can help to improve diseases management, minimize the risk of medication errors and to prevent possible diseases comorbidities (16). Briefly, the electronic medical record continuity of care is key to practitioners' time management of clinical information and therefore increases the return on their practices (17).

In Africa, the necessity of Electronic medical records use was triggered and reinforced by the necessity to maintain aggregated data to be reported to the governments of funding organizations (16). "The first OpenMRS system was implemented in Kenya and followed by Rwanda and South Africa to manage health information in patients with AIDS. Then, these systems were implemented in many countries, including Mozambique, Tanzania, Malawi, Senegal, Uganda and Haiti"(10). Afterwards, OpenMRS was in use in at least other 17 African countries namely: Botswana, Congo, Ethiopia, Gabon, Ghana, Mali, Malawi, Mozambique, Senegal, South Africa, Uganda, Lesotho, Gambia, Zanzibar, Nigeria, Zanzibar, Zimbabwe and Tanzania (3)

Although health information technology is not advanced in developing countries (6) , the Government of Rwanda (GoR) has made remarkable progress toward the utilization of EMR all over the country (5). At the beginning, in Rwanda OpenMRS was used in the treatment of HIV and TB in outpatients departments, and its implementation was under the support of the US President's Emergency Plan for AIDS relief and the Global Fund for AIDS, Tuberculosis and malaria (10). The GoR has adopted OpenMRS as national electronic medical record, and as of 2015, it was deployed and running in 250 healthcare facilities under the support of the ministry of health (MoH) and Partners in Health (3). In Kiziguro district Hospital, Electronic medical record namely OpenMRS was introduced in 2013 to support in the treatment and documentation of HIV and TB. In 2018 it was introduced in other clinical departments.

1.2. Problem statement

Although electronic medical records are widely used in Rwandan healthcare facilities, relatively few data are available regarding their effectiveness on the enhanced information technology communication (ICT) in healthcare service delivery to facilitate continuity of care in health facilities (5). In Rwandan healthcare facilities, the electronic medical filing was introduced with the use of OpenMRS and Open clinic mainly to replace paper-based medical records archives. It was reported that an increased continuity of patients' healthcare leads to an increased patients' outcome and satisfaction, and therefore enhances the effectiveness and efficiency of healthcare systems (18), through an improved clinical documentation and medication refill turnaround time (16). Such continuity makes use of previously stored patients' information from previous patients' visits to seek healthcare services.

The main objective of this research project was to evaluate effectiveness of electronic medical records system on continuity of patients' care in Rwandan healthcare facilities by determining the patients' experience with the healthcare providers' use of stored information in EMR and by determining the level at which healthcare providers communicate with each other through EMR while practicing their job.

1.3. Significance of the study

Investment in Electronic Medical Records (EMR) can be justified if it only can help in increasing revenues, decrease costs, improve patient care or the combination of all of them in order to maximize reimbursement and customer satisfaction.

First and foremost, patients will benefit from the results of this project because the challenges of implementing a one medical patient's file policy to facilitate continuity of care facilities will be identified, from which their healthcare facilities can develop strategies to address them.

In addition, patients will benefit from the results of this project because their continuity of care will be strengthened and solutions to the challenges of implementing a one medical patient's file policy to facilitate continuity of care facilities will be proposed and communicated.

With regard to patients' continuity of care, the results of this project will help healthcare facilities to trust in investing in EMR basing on reliable information because healthcare providers are motivated by the proper use of EMR which help their clients to be satisfied with the continuity of healthcare service they receive.

Also, in a paper based system, the billing staff may willingly leave out the billing process or may erroneously enter fewer units which in return results into lower billing and hence lower reimbursement. This, in contrast, can be avoided by the use of EMR by capturing all charges of healthcare services provided by the treating healthcare provider and thereby preventing the loss of revenues.

Furthermore, Electronic medical records benefit the continuation of care through improved data input, the transcription cost reduction, better information sharing, communication referrals, laboratory test order and results sharing, medical prescriptions, drug history; and improved healthcare is ensured through the avoiding of information duplication. Therefore, the healthcare facilities will know how they can strengthen continuity of care and have reliable data for future use (for example in decision making on how patient care can be improved, drug requisition and acquisition, future researches...)

Lastly, with a paper based system, healthcare providers spend significant time during writing or documentation the patients' medical history (writing and reviewing the written transcript) during

the journey of healthcare services in different departments while at the healthcare facility whereas in EMR the healthcare provider types few key words and does not need to spend too much time asking for medical histories, typing and reviewing notes. This will lead to an improved patients' care because healthcare providers may use that time concentrating on patients' issues.

1.4. Research questions:

- 1) What is the patients' experience with the healthcare providers' use of stored information in EMR within the past 12 months?
- 2) What is the level at which healthcare providers communicate with each other through EMR while practicing their job?

1.5. Main objective:

The project aimed to assess how electronic medical records system enhances continuity of care for patients, through the implementation of a single medical file for each patient in healthcare facilities.

1.6. Specific Objectives:

1. To determine the patients' experience with the healthcare providers' use of stored information in EMR within the past 12 months
2. To determine the level at which healthcare providers communicate with each other through EMR while practicing their job
3. To determine the level of health facility's implementation of one medical patient's file policy to facilitate continuity of care

CHAPTER 2: LITERATURE REVIEW

2.1. INTRODUCTION

In this chapter, the existing evidence is discussed. Mainly, the identified benefits of EMR/OpenMRS use in healthcare facilities are described. In addition, benefits of patients' continuity of care through EMR use and challenges to implement a one medical patient's file through EMR use are discussed. Furthermore, the section identifies the existing gaps and conclusion of the literature review.

2.2. GENERAL BENEFITS OF EMR USE IN HEALTHCARE FACILITIES

The ultimate goal of EMR use is the improvement of workflow of long time paper-based patients' files by decreasing or even eliminating the risk of losing hard copies documents (which sometimes are illegible), and therefore avoid request duplications and generate automated prescription request instead (17). In this instance, stored data can easily be retrieved, reused and read by the healthcare provider. In addition, electronic medical records systems help in the reduction of transcription errors (which are frequently reported from paper-based medical records systems), reducing the risk of missing/loss of some medical files, saving huge rooms from paper-based archives and minimizing overtime labor expenses (25). Lastly, EMR use was associated with an increased return on investment in Rwanda (19).

Description of OpenMRS electronic medical record system

“The modular structure of OpenMRS is unique in that it allows for integration of both core development team modules and modules from other developers, creating versatile and easily updatable systems. Typically, implementations use between 35 to 45 modules, ensuring that the core code is common to almost all OpenMRS installations. Data is stored in a concept dictionary, which allows for flexibility in data capture and translation to other languages. This approach also supports various standards for data storage and exchange, with mappings available for coding standards such as the International Classification of Diseases and Logical Observation Identifiers Names and Codes. Adapting OpenMRS for new uses often requires technical expertise, including Java programming if new modules are needed. There were limitations with the older

user interface used in this project, but it has now been replaced, and clinical workflows must be developed with care. OpenMRS can be adapted to support a range of care, including HIV, multidrug-resistant tuberculosis, primary care, emergency care, heart disease, oncology, and surgery. A Server Monitoring Tool module was created to track system uptime and downtime, daily data entry rates, and completeness of key variables, which was used in a larger evaluation study in Rwanda. OpenMRS was developed by collaboration between the Academic Model Providing Access to Healthcare project, the Regenstrief Institute, the Partners in Health Informatics team, and the South African Medical Research Council. Ongoing maintenance of the core OpenMRS platform is done through a worldwide network of volunteers with technology, healthcare, and international development expertise known as the OpenMRS community”.(13).

Among benefits of EMR, the reduction of the cost incurred by the healthcare information management is more important. In addition, EMR can help to reduce problems associated with logistics and improve quality through automation of health information exchange services (17). Stored health information can help in future researches to identify and establish new evidence based practice or knowledge (20), therefore improving the quality of patients’ healthcare services (21). Furthermore, electronic medical records use enhance the a quick creation and easy access to complete patients clinical information and its flow to those caring for the patient (11).

2.3. PATIENTS’ CONTINUITY OF CARE AMONG PATIENTS WITH CHRONIC DISEASES

In developing countries, the World Health Organization (WHO) states that “the burden of chronic diseases is increasing rapidly and will have significant social, economic and health consequences” (22). Designing a system or systems to facilitate in the management of one or more chronic health condition over a long period of time may be difficult, therefore, continuity of patient care may be a vital process to ensure quality outcomes of healthcare interventions for healthcare providers, patients, families and caregivers (2). Because patients with chronic diseases require a continuous and complex management of their condition from a variety of healthcare providers across hospital departments, continuous of patient care may lead to a diminished healthcare cost, reduced fragmentation of care, better prognosis and improved level of patients’ satisfaction (23). It was reported that continuity of care is appreciated by patients with chronic conditions (24). Coordination of communication and information sharing among those caring for

the same patient with chronic health condition from various healthcare services was shown to improve patient's health outcome (25). This help to give harmonious advices to patients with chronic health conditions (regarding their life style, for example). Electronic medical records systems help/OpenMRS help to improve documentation and improved patient data coding which would otherwise result into poor health outcomes (25).

2.4. BENEFITS OF PATIENTS' CONTINUITY OF CARE

The literature confirms the association between an increased provider continuity and patient outcomes and satisfaction improvement, and continuity of care seems to be important on high quality level of patient care (18). Deficit in communication among those caring for the same patient may negatively impact patient healthcare, and therefore computer information system (such as electronic medical records systems) may improve the sharing of patients' information practice (15). Electronic medical records benefit the continuation of care through improved data input, the transcription cost reduction, better information sharing, communication referrals, laboratory test order and results sharing, medical prescriptions, drug history; and improved healthcare is ensured through the avoiding of information duplication (26).

2.5. CHALLENGES TO IMPLEMENT ONE MEDICAL PATIENT'S FILE THROUGH EMR USE

Electronic medical records use is believed to enhance both continuity and quality of patients' healthcare (13). The study which was conducted in Rwanda reported that challenges to implement EMR were: inadequate information technology infrastructures, frequent electricity cutoff, slow internet and lack of ICT skills for clinical staff among others (27). Other commonly reported challenges to implement and adopt electronic medical records systems include: behavioral and economic barriers which may prevent mainly private healthcare facilities to invest in electronic medical records systems (17).

2.6. POSSIBLE DISADVANTAGES ASSOCIATED WITH EMR USE

Poor adoption of EMR was shown to be associated with high initial and ongoing (maintenance and updating) cost, and most importantly uncertainty about the return on the investment (17). Furthermore, short term reduction of productivity during the adoption phase which can result into the reduction of revenues together with concerns about security and privacy are possible (20). For instance, it was reported that the initial productivity loss can be as high as 20%, 10%

and 5% in the first, second and third month respectively following an electronic health record adoption (21).

2.7. COMMON SOLUTIONS TO CHALLENGES TO IMPLEMENT ONE MEDICAL PATIENT'S FILE THROUGH EMR USE

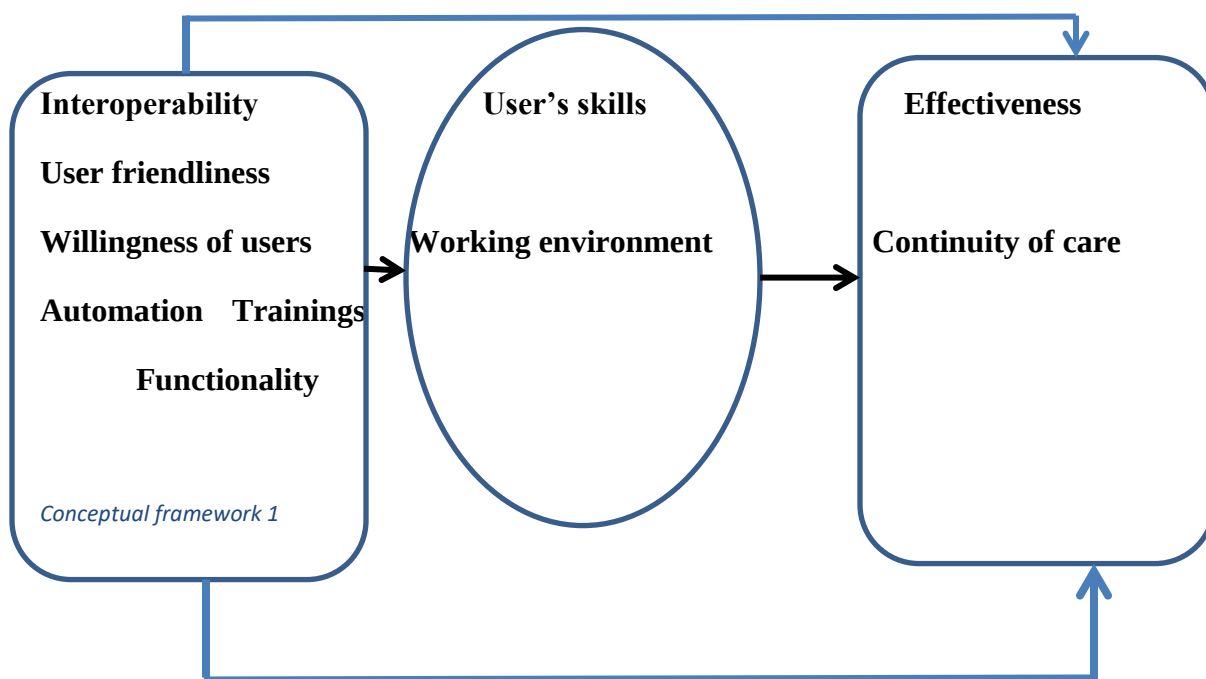
The ability to overcome the electronic medical record system cost seems to be difficult and can require government funding which can enhance the adoption and use of EMR by healthcare facilities (28). In addition, low cost electronic medical records systems with few or no licensing cost can be a durable solution (28).

2.8. CONCEPTUAL FRAMEWORK

INPUTS/STRUCTURE

PROCESS

OUTCOME



As illustrated in the figure above, it is imperative that the Electronic Medical Record (EMR) system be implemented by utilizing the provided framework to achieve continuity of patients'

care shows inputs/structure (also known as independent variables) such as: user's friendliness, willingness, automation of the system and interoperability; the process (also known as moderating variables) such as: user's IT skills, working environments/equipments/network and trainings; and outcome (also known as dependent variables) such as continuity of care, effectiveness and functionality.

Source: adapted from the study (3) by Uwamariya J. A

2.9. CONCLUSION

The literature clearly shows that the electronic medical records implementation is essential to quality healthcare service delivery through enhanced continuity of care, minimization of medication errors, effective and timely sharing of patients' data regarding diagnosis, history and investigation and to prevent possible diseases comorbidities (16) (15). Although challenges such as: inadequate information technology infrastructures, frequent electricity cutoff, slow internet and lack of ICT skills for clinical staff (27) and behavioral and economic barriers which may prevent mainly private healthcare facilities to invest in systems for managing electronic medical records. (17) have been reported in the literature like factors hindering the EMR implementation, solutions such as government incentives toward EMR use and low cost electronic medical records systems with few or no licensing cost can be a durable solution were also reported (28).

CHAPTER 3: METHODOLOGY

3.1. Introduction:

In the present chapter, it was described how scientific inquiry was conducted, whereby the study setting was described, the population and sampling methods were determined, data collection methods were described, and data analysis tools were mentioned. In addition, the inclusion and exclusion criteria were described.

3.2. Study setting

The study research was conducted in Kiziguro District Hospital. This setting was convenient to the researcher because it has been using OpenMRS in all its departments since September 2019 (at least three years before the period of data collection).

Kiziguro District Hospital was established in 1985 by the Catholic Church diocese of Byumba, in eastern Province, Gatsibo district and Kiziguro sector. It is governed upon an agreement between the government of Rwanda and the catholic diocese of Byumba. It covers eleven health centers with a catchment area of 418180 inhabitants. It has 123 beds, 4 ambulances, clinical departments which offer services in minor surgery, internal medicine, pediatry, maternity, neonatology, outpatients, dentistry, mental health, laboratory, HIV/ART, physiotherapy, and ophthalmology.

Source: Kiziguro District Hospital administrative manual 2021.

3.3. Research design

The cross-sectional study design was used. The researcher intended to collect data from available patients with chronic diseases at the time of data collection regarding their experience while visiting the hospital on multiple occasions for healthcare. This was more relevant when it came to identifying knowledge (29) for example what advantages associated with OpenMRS use were. In addition, the researcher intended to collect data from available members of staff who were receiving/consulting patients at the time of questionnaires completion/data collection regarding their experience while using EMR/OpenMRS for patients who visited the hospital on multiple occasions for healthcare.

3.4. Data collection method

The method used to gather information was through the use of closed-ended questionnaires. Upon reviewing the literature, we obtained approval from the developers of the questionnaires before adopting them. The questionnaire was self-administered.

The patients' questionnaire had three sections:

The section one asked questions about patients' consultation history;

Section two asked questions about the patient's healthcare provider;

If patients had not seen their healthcare provider in past 12 months, they would skip to the following section.

Section three posed questions about the degree to which healthcare providers in general practice collaboratively. (For instance: healthcare provider in that department and others from other departments).

If patients had not consulted any other healthcare provider apart from the one in that department, they would be done with the questionnaire.

The healthcare provider's questionnaire also had three sections whereby:

Section one: work details which explored the categories of staff and working experience

Section two asked questions regarding the level of health facility's implementation EMR (the participant would mark where appropriate).

Section three asked questions regarding the level of health facility's implementation of one medical file per patient through EMR use (the participant would mark where appropriate).

3.4.1. Pilot study

The elaborated questionnaire basing on the literature was tested on 10 convenient participants who were selected among the study population. This helped the researcher to see whether the data collection tool (especially the Kinyarwanda translated version) would help to collect desired data from the study population, and changes were made where necessary.

3.5. Study population

The study population consisted of patients with a chronic condition (Diabetes, hypertension, mental health disorders, asthma and HIV) who had visited Kiziguro Hospital at least two times in the past twelve months from the data collection period.

The staff study population was composed of clinical staffs who were working in consultation rooms and triage/vital signs office (twelve doctors, nineteen allied health professionals and six nurses of outpatients department who carry out the triage process and take patients' vital signs) who admitted patients every time they came at the hospital.

3.6. The sampling and the appropriate sample size to use

This is the process whereby a sufficient and representative sample was drawn from the research population to serve as research subjects. A convenient sampling method was used. This was because the researcher had limited funds and time to conduct this research and therefore preferred the research subjects who could be easily found (30).

3.6.1. Sample size determination

The Taro Yamane formula was utilized to compute and determine the sufficient and representative sample size for this research study as a small population of 200 patients (Source: HMIS data of the hospital) with chronic diseases was expected (31).

Formula: $S = \frac{N}{1 + N(e)^2}$

Where:

S: sample size

N: total research subjects

e: error. In this research study, the confidence level was 95%; therefore error (e) was 0.05.

Therefore, the study sample (S) was: $200 / 1 + 200(0.05)^2 = 134$ patients

Because the staff study population was small, available staff among 37 (twelve doctors, nineteen allied health professionals and six nurses of outpatients department who carry out the triage process and take patients' vital signs) who were working at outpatient and other entry points

were recruited as sample subjects. During the whole data collection period, 3 eligible members of staff were not available, and therefore data were collected from 34 out of 37 members of eligible staff.

Source: Administrative manual of Kiziguro District Hospital

3.6.2. Inclusion criteria

The available OpenMRS modules have been in full utilization in all departments of Kiziguro district Hospital from September 2019. Therefore, the target sample subjects were all patients with chronic condition (Diabetes, hypertension, mental health disorders, asthma and HIV) who had visited Kiziguro Hospital at least two times in the past twelve months from the data collection period (7th -30th November 2022).

All convenient staff members who were available during the data collection period (7th -30th November 2022) and whose scope of services included patient's consultation as initial contact were included in the study.

3.6.3. Exclusion criteria

All patients with chronic conditions (Diabetes, hypertension, mental health disorders, asthma and HIV) who had visited Kiziguro Hospital less than two times in the past twelve months from the data collection period were excluded. This was because they did not have existing patient's history/information already stored in OpenMRS for future use.

In addition, staff members who were available but whose scope of services did not include patient's consultation were excluded from the study.

3.7. Study limitation

The study research was conducted in Kiziguro District hospital. The findings can't be generalized for primary healthcare facilities (health centers) because they don't use EMR systems in all healthcare services at the data collection period (7th -30th November 2022).

3.8. Ethical consideration

The scientific and ethical approval for conducting the research was sought for ethical clearance purpose from UR-CMHS Ethical committee. The permissions were sought from the Hospital

Ethics committee and Kiziguro District Hospital/ethics and research committee allowed data collection. Research objectives and confidentiality were explained to participants and the researcher answered all the questions which were asked by the participants about the research.

The researcher consented neither to disclose nor publish confidential information collected from participants (such as names) used in this study, and therefore informed consent and confidentiality forms were signed.

3.9. Data entry, management and analysis method

The questionnaires were reviewed for completeness and numbered serially. After data collection, questions were given codes and data were cleaned using MS Excel.

SPSS Version 21 was used for data analysis and presentation (tables). The completed questionnaires were kept by the researcher confidentially for future reference.

CHAPTER 4: RESULTS

4.1. Introduction

Tables were used to present the research study results in this chapter. In addition, the researcher interpreted the meaning, contextualized and explained the use and importance of research study results.

4.2. RESULTS ON PATIENTS' EXPERIENCE

4.2.1 Demographic data

A big number of 75 (56%) of study participants' had age between 20-50 years. Participants' age was grouped into three classes: the percentages of participants whose age was below 20 years were 18 % (N=24) of all participants, those whose age was above 50 years was 26 % (N=35) of all participants and those whose age was between 20-50 years was 56% (N=75) of all participants.

Majority of study participants had visited the hospital at least four times in the past twelve months at the time of data collection. Participants' consultation history was grouped into three categories: two visits, three visits and at least four visits in one or more hospital services or departments. 13% (N=17) of all participants had visited the hospital service (s) two times, 16% (N=22) of all participants had visited the hospital service (s) three times and 71% (N=95) of all participants had visited the hospital service (s) at least four times.

Majority of participants had consulted at least 3 different healthcare providers in the past twelve months from the time of data collection. Participants' encounters history were grouped into three categories namely: having consulted only one healthcare provider in each of their visits, having consulted two different healthcare providers in their visits and having consulted at least three different healthcare providers in their visits during the last twelve months prior to data collection. 11% (N=15) had consulted only one healthcare provider in each of their visits; 37% (N=49) had consulted two different healthcare providers in their visits and 52% (N=70) had consulted at least three different healthcare providers in their visits during the last twelve months prior to data collection.

Majority of study participants had visited one department during all their hospital visits in the past twelve months prior to data collection. This is because chronic conditions are often followed up in one particular service/department. Participants' department encounters history were grouped into three categories namely: having consulted only one department/service in each of their visits, having consulted two different departments/services in their visits and having consulted at least three departments/services in their visits during the last twelve months prior to data collection.

The study results revealed that 30% (N=40) of all study participants had consulted at two different departments; 30% (N=40) of all study participants had consulted at least three different departments and 40% (N=54) all study participants had consulted only one department during all their hospital visits in the past twelve months prior to data collection.

Table1. Description of demographic characteristics of patients

Variables		N	%
Age	Below 20 years	24	18
	Between 20-50 years	75	56
	Above 50 years	35	26
	Total	134	100
Number of healthcare visits/12 months	2 visits	17	13
	3 visits	22	16
	>=4 visits	95	71
	Total	134	100
Number of healthcare provider consulted	1	15	11
	2	49	37
	>= 3	70	52
	Total	134	100
Number of departments visited	1	54	40
	2	40	30
	>= 3	40	30
	Total	134	100

4.2.2. STUDY RESULTS ON PATIENTS' EXPERIENCE WITH THEIR HEALTHCARE PROVIDER

The table below shows how well the study participants knew their healthcare provider (s).

Patients' experiences were grouped into five categories to indicate their level of agreement with the following statements by selecting one of the following options: strongly agree, agree, neutral, disagree, or strongly disagree. Toward the statement about being familiar with the healthcare provider, majority of participants strongly agreed that they knew their healthcare provider very well. The study results revealed that 1% (N=1) of all study participants strongly disagreed with the statement and therefore did not know their healthcare provider; 1% (N=2) reported that they disagreed; 3% (N=4) of all study participants were neutral; 35% (N=47) agreed with the statement and 59% (N=79) strongly agreed that they knew their healthcare provider very well. In addition, the above table shows how well the study participants believed that their healthcare provider knew their medical history. Patients' experiences toward healthcare knowledge on patients' medical history were grouped into the above mentioned five categories. Toward the statement about healthcare provider being well-versed in patients' medical history; majority of participants strongly agreed that they believed that their healthcare provider was well-informed about the patient's medical history. The study results revealed that 1% (N=2) strongly disagreed that their healthcare provider was well-informed about the patient's medical history. In addition, 4% (N=5) of all study participants disagreed; 3% (N=4) were neutral; 40% (N=54) agreed and 51% (N=69) agreed wholeheartedly that they believed that their healthcare provider knew their medical history.

Furthermore, the below table shows how well the study participants believed that they felt reassured that the healthcare provider remembers what was discussed during patient's previous visit. Patients' experiences toward healthcare knowledge on what the healthcare provider did during their last encounter were grouped into the fore mentioned five categories. Toward the statement about whether the healthcare provider consistently recalled the details of patient's previous visits, majority of participants strongly agreed that they believed that their healthcare provider consistently recalled the details of their previous visits. The study results showed that 1% (N=2) strongly disagreed; 6% (N=8) disagreed and 11% (N=15) were neutral toward the

belief that their healthcare provider (s) always remembers what they did during their last encounter. On the contrary, 26% (N=35) agreed and 55% (N=74) strongly agreed that their healthcare provider (s) always remembered what they did during their last encounter.

Therefore, overall 81% (N=109) of the study participants agreed that their healthcare provider (s) always remembered what they did during their last encounter.

From the below table, it also shown how well the study participants believed their healthcare providers knew their family circumstances very well. Patients' experiences toward healthcare knowledge on participants' family circumstances were again grouped into the above mentioned five categories. Toward the statement regarding whether the healthcare provider was well aware of patient's family situation, majority of participants reported toward disagreeing that they believed that their healthcare providers knew their family circumstances very well. The study results showed that 5% (N=7) strongly disagreed; 31% (N=41) disagreed and 9% (N=12) were neutral toward the belief that their healthcare providers knew their family circumstances very well. On the other hand, 25% (N=33) agreed and 30% (N=40) strongly agreed that their healthcare providers knew their family circumstances very well.

Therefore, only about 55% (N=73) of the study participants agreed that their healthcare providers knew their family circumstances very well.

The below table also shows how well the study participants believed their healthcare providers knew patients' routine very well. Patients' experiences toward healthcare knowledge on what the patients do in their routine were grouped into five categories and regarding the statement asking about healthcare provider being very familiar with patient's daily activities and routines, majority of participants strongly agreed that they believed that their healthcare providers knew what their daily activities and routines were. The study results showed that 1% (N=2) strongly disagreed; 16% (N=21) disagreed and 8% (N=11) were neutral toward the belief that their healthcare providers knew what their daily activities and routines were. On the contrary, 34% (N=46) agreed and 40% (N=53) strongly agreed that their healthcare providers knew what their daily activities and routines were. Therefore, overall 74% (N=99) of the study participants agreed that their healthcare providers knew what their daily activities and routines were.

It is also shown from the below table how well the study participants believed that healthcare providers proactively contacted their patients when necessary, without the need for the patient to request for it. Patients' experiences toward the belief of whether their healthcare providers proactively contacted their patients when necessary, without the need for the patient to request for it were grouped into five categories. Toward the statement asking Patients' experiences toward the belief of whether their healthcare providers proactively contacted their patients when necessary, without the need for the patient to request for it, majority of participants strongly agreed that they believed that their healthcare providers proactively contacted their patients when necessary, without the need for the patient to request for it. The study results showed that 1% (N=2) strongly disagreed with the statement; 9% (N=12) disagreed and 3% (N=4) were neutral toward the belief that their healthcare providers proactively contacted them when necessary, without the need for them to request for it. On the contrary, 31% (N=42) agreed and 53% (N=71) strongly agreed that their healthcare providers proactively contacted their patients when necessary, without the need for the patient to request for it. Therefore, overall 84% (N=113) of the study participants agreed that their healthcare providers proactively contacted their patients when necessary, without the need for the patient to request for it.

The below table, furthermore, shows how well the participants in the study had confidence that their healthcare providers understood patients' priorities when it came to receiving care. Patients' experiences toward healthcare providers understanding of patients' priorities when it came to receiving care were grouped into five categories. Regarding this matter, majority of participants strongly agreed that they believed that their healthcare understood patients' priorities when it came to receiving care. The study results showed that 2% (N=3) strongly disagreed; 9% (N=12) disagreed and 3% (N=4) were neutral toward the belief that their healthcare providers understood patients' priorities when it came to receiving care. On the contrary, 34% (N=46) agreed and 49% (N=65) strongly agreed that their healthcare providers understood patients' priorities when it came to receiving care. Therefore, overall 83% (N=111) of the study participants agreed that their healthcare understood patients' priorities when it came to receiving care.

The below table shows how well the study participants believed that it was important for healthcare providers to ensure that they maintain sufficient communication with their patients

when they receive care from other healthcare providers. Patients' experiences toward healthcare knowledge on the belief that their healthcare providers ensured that they maintain sufficient communication with their patients when they were receiving care from other healthcare providers were grouped into five categories. Majority of participants strongly agreed that they believed that their healthcare providers ensured that they maintain sufficient communication with their patients when they were receiving care from other healthcare providers. The study results showed that 1% (N=1) strongly disagreed; 5% (N=7) disagreed and 3% (N=4) were neutral toward the belief that their healthcare providers ensured that they maintained sufficient communication with their patients when they were receiving care from other healthcare providers. On the contrary, 31% (N=41) agreed and 56% (N=75) strongly agreed that their healthcare providers ensured that they maintained sufficient communication with their patients when they were receiving care from other healthcare providers. Therefore, overall 87% (N=116) of the study participants agreed that their healthcare providers ensured that they maintained sufficient communication with their patients when they were receiving care from other healthcare providers.

Table2. The patients' experience with the healthcare providers' use of stored information in EMR

Variables				Statement	N	%
Being familiar with the healthcare provider.				Strongly agree	79	59
				Agree	47	35
				Neutral	4	3
				Disagree	2	1
				Strongly disagree	1	1
				Total	133	99
Healthcare provider being well-versed in patients' medical history.				Strongly agree	69	51
				Agree	54	40
				Neutral	4	3
				Disagree	5	4
				Strongly disagree	2	1

	Total	134	100
Always feeling reassured that the healthcare provider remembers what was discussed during patient's previous visit(s).	Strongly agree	74	55
	Agree	35	26
	Neutral	15	11
	Disagree	8	6
	Strongly disagree	2	1
	Total	134	100
Healthcare provider being well-informed about my family situation.	Strongly agree	40	30
	Agree	33	25
	Neutral	12	9
	Disagree	41	31
	Strongly disagree	7	5
	Total	133	99
Healthcare provider being very familiar with patient's daily activities and routines	Strongly agree	53	40
	Agree	46	34
	Neutral	11	8
	Disagree	21	16
	Strongly disagree	2	1
	Total	133	99
Healthcare provider proactively reaching out to patients when needed, without them having to request for it.	Strongly agree	71	53
	Agree	42	31
	Neutral	4	3
	Disagree	12	9
	Strongly disagree	2	1
	Total	131	98
Healthcare provider being aware of what patients consider as important when it comes to their care.	Strongly agree	65	49
	Agree	46	34
	Neutral	4	3
	Disagree	12	9
	Strongly disagree	3	2
	Total	130	97

Healthcare provider maintaining	Strongly agree	75	56
adequate communication with	Agree	41	31
patients when they receive care	Neutral	4	3
from other providers.	Disagree	7	5
	Strongly disagree	1	1
	Total	128	95

4.2.3. STUDY RESULTS ON HOW HEALTHCARE PROVIDERS IN GENERAL PRACTICE WORK TOGETHER

The below table shows how well the study participants believed that their healthcare providers communicate information effectively with one another. Their experiences were grouped into five categories namely: strongly agree, agree, neutral, disagree and strongly disagree. Patients' experiences toward the belief that their healthcare providers communicate information effectively with one another were grouped into above five categories. Majority of participants strongly agreed that they believed that their healthcare providers communicate information effectively with one another. The study results showed that 1% (N=1) disagreed and 3% (N=4) were neutral toward the belief that their healthcare providers communicate information effectively with one another. On the contrary, 35% (N=47) agreed and 51% (N=68) strongly agreed that their healthcare providers communicate information effectively with one another.

Therefore, overall 86% (N=115) of the study participants agreed that their healthcare providers communicate information effectively with one another.

In addition, the below table shows how well the study participants believed that their healthcare providers collaborate effectively with each other. Patients' experiences toward healthcare knowledge on the belief that their healthcare providers collaborate effectively with each other were grouped into five categories. Majority of participants strongly agreed that they believed that their healthcare providers collaborate effectively. The study results showed that 1% (N=2) disagreed and 1% (N=2) was neutral toward the belief that their healthcare providers collaborate

effectively. On the contrary, 32% (N=43) agreed and 57% (N=76) strongly agreed that their healthcare providers collaborate effectively with each other.

Therefore, overall 89% (N=119) of the study participants agreed that their healthcare providers collaborate effectively with each other.

Further, the below table shows how well the study participants believed that the care that healthcare providers give is well-coordinated. Patients' experiences toward healthcare knowledge on the belief that the care that healthcare providers give is well-coordinated were grouped into five categories. Majority of participants strongly agreed that they believed that the care that healthcare providers gave was well-coordinated. The study results showed that 4% (N=5) disagreed and 2% (N=3) were neutral toward the belief that the care that healthcare providers gave them was well-coordinated. On the contrary, 35% (N=47) agreed and 48% (N=64) strongly agreed that the care that healthcare providers gave them was well-coordinated. Therefore, overall 83% (N=111) of the study participants agreed that the care that healthcare providers gave them was well-coordinated.

Furthermore, the below table shows how well the study participants believed that healthcare providers are highly knowledgeable about the actions of their colleagues. Patients' experiences toward healthcare knowledge on the belief their healthcare providers are highly knowledgeable about the actions of their colleagues were grouped into five categories. Regarding the statement about whether healthcare providers are highly knowledgeable about the actions of their colleagues, majority of participants strongly agreed that they believed that healthcare providers were highly knowledgeable about the actions of their colleagues. The study results showed 3% (N=4) disagreed and 5% (N=7) were neutral toward the belief that healthcare providers were highly knowledgeable about the actions of their colleagues. On the contrary, 31% (N=41) agreed and 50% (N=67) strongly agreed that healthcare providers were highly knowledgeable about the actions of their colleagues. Therefore, overall 81% (N=108) of the study participants agreed that healthcare providers were highly knowledgeable about the actions of their colleagues.

Table3. Patients' experiences about how healthcare providers in general practice work together

Variables		Statement	N	%
Healthcare providers communicating information effectively with one another		Strongly agree	68	51
		Agree	47	35
		Neutral	4	3
		Disagree	1	1
		Total	120	90
Healthcare providers collaborating effectively with each other.		Strongly agree	76	57
		Agree	43	32
		Neutral	2	1
		Disagree	2	1
		Total	123	92
Healthcare providers being well-coordinated.		Strongly agree	64	48
		Agree	47	35
		Neutral	3	2
		Disagree	5	4
		Total	119	89
Caregivers being always well-informed about the actions of their colleagues.		Strongly agree	67	50
		Agree	41	31
		Neutral	7	5
		Disagree	4	3
		Total	134	100

4.3. RESULTS ON STAFF EXPERIENCE

4.3.1. Demographic data

The following table displays the percentage of staff categories that took part in the research study. The clinical staff comprised all the participants in the study and was categorized as doctors, allied health professional and nurses/midwives. The study results showed that 55.9% (N=19) of all study participants were allied health professionals, 26.5% (N=9) were doctors and 17.6% (N=6) were nurses/midwives.

In addition, the table below presents the proportion of staff's experience in using EMR/OpenMRS during healthcare service delivery. The participants experience in using OpenMRS was categorized as below 1 year, between 1-2 years and above 2 years.

The study results showed that 67.6% (N=23) of all the study participants 'experience was above 2 years of using OpenMRS, 14.7% (N=5) of all the study participants 'experience was 1-2 years of using OpenMRS and 17.6% (N=6) of all the study participants 'experience was below 1year of using OpenMRS.

Table4. The demographic details of staff (category of staff, staff's experience with OpenMRS use)

Variables	Statements	N	%
category of staff	Doctor	9	26.5
	Allied health Professional	19	55.9
	Nurse/Midwife	6	17.6
	Total	34	100.0
Experience with OpenMRS use	below 1year	6	17.6
	between 1-2 years	5	14.7
	above 2 years	23	67.6
	Total	34	100.0

4.3.2. THE LEVEL OF HEALTH FACILITY’S IMPLEMENTATION EMR/OpenMRS

The below table presents the proportion of staff members who found OpenMRS system to be user-friendly and also appreciated how it enhanced their clinical performances. Staff’s experiences toward finding EMR/OpenMRS system easy to use and that helping them improve their clinical performance were grouped into three categories namely: Agree, Disagree and Do not know. Toward the statement about finding EMR system as quite intuitive, and having it also helping the providers to enhance their clinical performance, majority of respondents reported that OpenMRS system was user-friendly and also appreciated how it enhanced their clinical performances. The study results revealed that among all staff members who participated in the current study, 3% (N=1) did not know how to express their experience whereas 15% (N=5) disagreed with the statement. On the other hand, 82% (N=28) agreed that OpenMRS system was user-friendly and also appreciated how it enhanced their clinical performances.

In addition, the below table also presents the proportion of staff members feeling confident in their ability to make clinical decisions based on the information available in OpenMRS. Staff’s experiences toward feeling confident in their ability to make clinical decisions based on the information found in OpenMRS were grouped into three categories namely: Agree, Disagree and Do not know toward the statement about feeling confident in their ability to make clinical decisions based on the information available in OpenMRS. Majority of respondents reported that they were confident in their ability to make clinical decisions based on the information available in OpenMRS. The study results revealed that among all staff members who participated in the current study, 3% (N=1) did not know how to express their experience whereas 24% (N=8) disagreed with the statement. On the other hand, 74% (N=25) agreed that they were confident in their ability to make clinical decisions based on the information available in OpenMRS.

Further, the table below presents the proportion of staff members possessing the required expertise to utilize OpenMRS. Staff’s experiences toward possessing the required expertise to utilize OpenMRS were grouped into three categories namely: Agree, Disagree and Do not know toward the statement “I possess the required expertise to utilize OpenMRS”. Majority of respondents reported that they had the required expertise to utilize OpenMRS. The study results revealed that among all staff members who participated in the current study, 15% (N=5) did not

know how to express their experience whereas 35% (N=12) disagreed with the statement. On the other hand, 50% (N=17) agreed that they possessed the required expertise to utilize OpenMRS.

Furthermore, the table below presents the proportion of staff members who reported that the implementation of OpenMRS enhances the quality of patient care. Staff's experiences toward reporting that the implementation of OpenMRS enhances the quality of patient care were grouped into three categories namely: Agree, Disagree and Do not know toward the statement about whether the implementation of OpenMRS enhances the quality of patient care. Majority of respondents reported that the implementation of OpenMRS enhances the quality of patient care. The study results revealed that among all staff members who participated in the current study, 6% (N=2) did not know how to express their experience whereas 32% (N=11) disagreed with the statement. On the other hand, 62% (N=21) agreed that the implementation of OpenMRS enhances the quality of patient care.

Lastly, the table below presents the proportion of staff members who reported that EMR use in the hospital is easy for the healthcare provider and they have no trouble accessing it. Staff's experiences toward reporting that EMR use in the hospital is easy for the healthcare providers and that they have no trouble accessing it were grouped into three categories namely: Agree, Disagree and Do not know. Majority of respondents reported that EMR use in the hospital was not easy for the healthcare provider and they had trouble accessing it. The study results revealed that among all staff members who participated in the current study, 6% (N=2) did not know how to express their experience whereas 56% (N=19) disagreed with the statement. Only 35% (N=12) agreed that EMR use in the hospital is easy for the healthcare provider and they have no trouble accessing it.

Table 5. The staff' experience with level of health facility's implementation of EMR/OpenMRS

Variables	Statement	N	%
Finding EMR system as quite intuitive, and having it also helping the providers to enhance their clinical performance.	Agree	28	82
	Disagree	5	15
	Do not know	1	3
	Total	34	100
Feeling confident in the ability to make clinical decisions based on the information available in OpenMRS.	Agree	25	74
	Disagree	8	24
	Do not know	1	3
	Total	34	100
Possessing the required expertise to utilize OpenMRS.	Agree	17	50
	Disagree	12	35
	Do not know	5	15
	Total	34	100
The implementation of OpenMRS enhances the quality of patient care.	Agree	21	62
	Disagree	11	32
	Do not know	2	6
	Total	34	100
EMR use in the hospital is easy for the healthcare provider and they have no trouble accessing it.	Agree	12	35
	Disagree	19	56
	Do not know	2	6
	Total	33	97

4.3.3. THE LEVEL OF HEALTHCARE PROVIDERS COMMUNICATION THROUGH EMR

The table below presents the proportion of staff members who reported that they believed that all patients' information is kept in one electronic medical file. Staff's experiences toward reporting that they believed that all patients' information is kept in one electronic medical file were grouped into three categories namely: Yes, No and Don't remember toward the statement "I believe that all patients information is kept in one electronic medical file". Majority of respondents agreed that they believed that all patients' information is kept in one electronic medical file. The study results revealed that among all staff members who participated in the current study 18% (N=6) answered No to the statement. On the other hand, 82% (N=28) agreed that they believed that all patients' information is kept in one electronic medical file.

The table below also presents the proportion of staff members who reported that every patient was given his unique ID number. Staff's experiences toward reporting that they believed that every patient is given his unique ID number were grouped into three categories namely: Yes, No and Don't remember toward the statement "Every patient is given his/her unique ID number". Majority of respondents agreed that they believed that every patient is given his unique ID number. The study results revealed that among all staff members who participated in the current study 3% (N=1) of all study participants did not remember if every patient is given his unique ID number, 29% (N=10) answered No to the statement. On the other hand, 68% (N=23) agreed that they believed that every patient is given his unique ID number.

Thirdly, the table below presents the proportion of staff members who reported that they ask the patient to give them his/her ID number at each time s/he comes to see them. Staff's experiences toward reporting that they ask the patient to give them his/her ID number at each time s/he comes to see them were grouped into three categories namely: Yes, No and Don't remember toward the statement "I ask the patient to give me his/her ID number at each time she/he comes me". Majority of respondents agreed that they ask the patient to give them his/her ID number at each time s/he comes to see them. The study results revealed that among all staff members who participated in the current study 3% (N=1) of all study participants did not remember if they ask

the patient to give them his/her ID number at each time s/he comes to see them; 12% (N=4) answered No to the statement. On the other hand, 85% (N=29) agreed that they believed that they ask the patient to give them his/her ID number at each time s/he comes to see them.

In addition, the below table presents the proportion of staff members who reported that sometimes they treat the patient with a different ID number (different from the one s/he used last time). Staff's experiences toward reporting that sometimes they treat the patient with a different ID number (different from the one s/he used last time) were grouped into three categories namely: Yes, No and Don't remember toward the statement "Sometimes I treat the patient with a different ID number different from the one s/he used at last visit". Majority of respondents disagreed that sometimes they treated the patient with a different ID number different from the one s/he used last time. The study results revealed that among all staff members who participated in the current study 3% (N=1) of all study participants did not remember if they ask the patient to give them his/her ID number at each time s/he comes to see them, 50% (N=17) disagreed that sometimes they treated the patient with a different ID number different from the one s/he used last time. On the other hand, about 47% (N=16) answered Yes to the statement.

Furthermore, the below table presents the proportion of staff members who reported that they believed that they check if the patient has only one ID number or more at each time s/he comes to see them. Staff's experiences toward reporting that they believed that they check if the patient has only one ID number or more at each time s/he comes to see them were grouped into three categories namely: Yes, No and Don't remember toward the statement "I believe I check if the patient has only one ID number or more at each time s/he comes to see me". Majority of respondents agreed that they check if the patient has only one ID number or more at each time s/he comes to see them. The study results revealed that among all staff members who participated in the current study 18% (N=6) of all study participants did not remember if they check if the patient has only one ID number or more at each time s/he comes to see them and 18% (N=6) answered they don't check if the patient has only one ID number or more at each time s/he comes to see them. On the other hand, 62% (N=21) agreed that they check if the patient has only one ID number or more at each time s/he comes to see them.

Lastly, the below table presents the proportion of staff members who reported they check patients' medical history and use it at each time s/he comes to see them. Staff's experiences

toward reporting that they check patients' medical history and use it at each time s/he comes to see them were grouped into three categories namely: Agree, Disagree and Do not know toward the statement "I believe I check patient's medical history and use it at each time s/he comes to me". Majority of respondents reported that they check patients' medical history and use it at each time s/he comes to see them". The study results revealed that among all staff members who participated in the current study, 9% (N=3) did not remember whether they check patients' medical history and use it at each time s/he comes to see them whereas 18% (N=6) reported that they did not check patients' medical history and use it at each time s/he comes to see them. On the other hand, 74% (N=25) agreed that they check patients' medical history and use it at each time s/he comes to see them.

Table 6. The staff' experience with level of healthcare providers' communication and information sharing through EMR/OpenMRS use

Variables	Statement	N	%
I believe I check if the patient has only one ID number or more	Yes	21	62
	No	6	18
	Don't remember	6	18
Total		33	98
I believe I check patients medical history and use it at each time s/he comes to see me	Yes	25	74
	No	6	18
	Don't remember	3	9
Total		34	100
I believe that all patients information is kept in one electronic file	Yes	28	82
	No	6	18
	Total	34	100
Every patient is given his unique ID number	Yes	23	68
	No	10	29
	Don't remember	1	3
Total		34	100
I ask the patient to give me his ID number at each time s/he comes to see me	Yes	29	85
	No	4	12
	Don't remember	1	3
Total		34	100
Sometimes I treat the patient with a different ID number different from what s/he used at the last visit	Yes	16	47
	No	17	50
	Don't remember	1	3
Total		34	100

4.3.4 Association between the frequencies of variables about patients' insights into how healthcare providers collaborate in general practice and healthcare providers' use of stored information in EMR in relation to patients' demographic data.

The table below represents association data about patients' experience on insights into how healthcare providers collaborate in general practice and healthcare providers' use of stored information in EMR in relation to patients' demographic data. The table shows that there was a positive experience of patients in believing that they knew very well their healthcare providers from the departments they visited (p-value=0.05) and that the healthcare provider from the departments they visited knew their medical history very well (p-value=0.01). In addition, there was a positive experience of patients in believing that healthcare provider recalled their last visit and what actions were taken (p-value=0.01) and the experience about healthcare provider knowing patients' family circumstances very well was also positive (p-value=0.01). Furthermore, there was a positive experience of patients in believing that healthcare provider knew what the patients' daily activities and routine were (p-value=0.00). The experience about healthcare providers proactively contacting patients as needed, without them having to request for it was also positive (p-value=0.02). Patients also believed that their healthcare providers stayed in touch with patients adequately when they were visiting other healthcare providers and the association was significant (p-value=0.02). In addition, there was a positive experience of patients in believing that healthcare providers effectively communicated and shared information with one another (p-value=0.03). Furthermore, there was also a positive experience of patients in believing that the healthcare providers collaborated excellently with each other (p-value=0.03). The health service which was given by the healthcare providers being very coordinated regarding its association with number of departments that patients had visited was also significant (p-value=0.02). Lastly, the healthcare providers were well-informed about the actions taken by their colleagues and it was also positively associated with number of departments that patients had visited (p-value=0.03).

Table7. Association between the frequencies of variables about patients' insights into how healthcare providers collaborate in general practice and healthcare providers' use of stored information in EMR in relation to patients' demographic data

Control Variables	Age	Number of healthcare visits/12 months	Number of healthcare provider consulted	Number of departments visited
I am very familiar with my healthcare provider	1.000	0.232	0.055	0.05*
My healthcare provider has a thorough understanding of patient's medical history.	1.00	0.22	0.04*	0.01*
My healthcare provider being familiar with past encounter's notes	1.00	0.23	0.06	0.01*
My healthcare provider knows my family circumstances very well	1.00	0.24	0.04*	0.01*
My healthcare provider is familiar with the patients' daily activities and routine	1.00	0.22	0.06	0.00*
My healthcare provider proactively contacts me as needed, without me having to request it.	1.00	0.23	0.08	0.02*
I feel that my healthcare provider stays in touch with me adequately when I visit other healthcare providers.	1.00	0.24	0.07	0.02*
The healthcare providers effectively communicate and	1.00	0.21	0.07	0.03*

share information with one another.				
The healthcare providers collaborating excellently with each other.	1.00	0.20	0.01*	0.03*
The health service given by the healthcare providers being very coordinated	1.00	0.19	0.06	0.02*
These healthcare providers are well- informed about the actions taken by their colleagues.	1.00	0.21	0.11	0.03*

* The frequency is significant at 0.05 levels

CHAPTER 5: DISCUSSION

5.1. Introduction

Results were discussed following the order of the study objectives as follows: first of all, results about Patients' experience with the healthcare providers' use of stored information in EMR were discussed, followed by results about Healthcare providers communication with each other through EMR while practicing their job on the second instance, and then results about Health facility's implementation of one medical patient's file policy to facilitate continuity of care on the third instance.

5.2. Patients' experience with the healthcare providers' use of stored information in EMR

As presented in the previous chapter, 55% (N=73) of patients who participated in the research study reported that they believed that their healthcare providers knew their family circumstances very well. As reported in a report, patients depend on their families for love, acceptance and most importantly, help in case of need (32) . In circumstances where stored information regarding patients' family circumstances are not used in patients' care, the quality of care may be compromised (26). The use of information stored in Electronic medical records regarding patients' family circumstances for patients care is important especially in situation where patients 'care involves family acceptance and help like in the case of chronic disease.

Regarding patients' experience with the healthcare providers' use of stored information in EMR, 74% (N=99) of patients who participated in the research study reported that they believed that their healthcare providers knew what the patients' daily activities and routine were. This showed globally that majority of patients reported a positive experience with healthcare providers' use of stored health information in EMR from different departments (p-value=0.00). That this is in accordance with the study conducted in Saudi Arabia which reported that patients were feeling that the physician interest in the medical record was increased (33). Knowledge about patients' daily activities may help the healthcare provider to well establish an effective patient-centered-care, especially in managing chronic diseases where self-management is much more needed (34). Therefore, the use information stored in Electronic medical records regarding patients' day-to-day life is needed to integrate healthcare in their routine so that their involvement be ensured. Furthermore, 81% (N=109) reported that their healthcare provider always remembered what he/she did during the patient's last visit, and it was statistically significant (p-value=0.01) and

91% (N=123) reported that their healthcare provider knew patient's previous medical notes and conditions; and the knowledge of available/stored patient's previous medical notes and conditions was statistically significant according to both the number of healthcare provider consulted (p-value=0.04) and the number of departments visited (p-value=0.01).

5.3. Healthcare providers communication with each other through EMR while practicing their job

As detailed below, the study participants believed that healthcare providers were connected enough with each other as they were using EMR. The same similar research findings in the United States reported that through EMR “individuals taking care of the same patients can easily and efficiently communicate with each other throughout the health setting. Ultimately, this will accelerate the process of diagnosing the patient correctly and lower the likelihood of potential additional complications.” (35). The fact that EMR use improves communication among those caring for the patient was also supported by other literature (36).

Regarding healthcare providers communication with each other through EMR while practicing their job, the study results showed that 86% (N=115) of patients who participated in the research study reported that they believed that their healthcare providers passed on information to each other very well. They might have realized it while they were not being asked the same information as those they had provided during their last visit, and therefore avoiding duplication or even loss of health information. The above mentioned information is statistically significant in relation to the number of departments that the patient had visited (p-value=0.03) As reported by Alex, duplication of health information is a sign of lack of healthcare services continuity, which is an important aspect in treating patients with chronic diseases (26). This in return hinders treatment outcomes because those caring for the same patients work independently instead of working as a team which focuses on the same goal in improving the health conditions of a patient with chronic disease (25) through the provision of harmonious health advices.

In addition, 81% (N=108) of patients who participated in the research study reported that they believed that their healthcare providers were well-informed about the actions taken by their colleagues while caring for them. The results on knowing patients' information which was already available in the EMR was statistically significant in relation to the number of departments that the patient had visited (p-value=0.03). This may result into good services

because it was reported that continuous of patient care may lead to a diminished healthcare cost, reduced fragmentation of care, better prognosis and improved level of patients' satisfaction (23). Effective communication and sharing of health information of the patient lead to quality healthcare service delivery.

Furthermore, 83% (N=111) of patients who participated in the research study reported that they believed that their healthcare providers were well-connected. This signifies that all healthcare providers work mutually and share information and investigations which were requested and provided in the previous sessions for the same purposes, and it was statistically proven in relation to the number of departments that the patient had visited ($p\text{-value}=0.02$). Information communication and sharing among different healthcare providers who care for the same patient may results into good outcomes as the literature confirms the association between an increased provider continuity and patient outcomes and satisfaction improvement, and continuity of care seems to be important on high quality level of patient care (18).

5.4. Health facility's implementation of one medical patient's file policy to facilitate continuity of care

Overall, the results of this research project revealed that the health facility fully implemented one medical patient's file policy to facilitate continuity of care due to lack of skills, improper patients' system ID number use and not checking patient's medical history and using it at each time s/he comes to see the healthcare provider. The literature also support the fact that implementation and adoption of EMR is hindered by the lack of computer skills of healthcare providers in the use of EMR (17).

As it was revealed by the results of this study, 85% (N=29) staff who participated in the research study reported that possessed the required expertise to utilize OpenMRS and 91% (N=31) staff who participated in the research study reported that EMR use in the hospital was easy for the healthcare provider and they had no trouble accessing it in the hospital area. Inadequate information communication technology (ICT) skills can be a challenge to the process of adopting one medical file per patient through EMR use (27). Continuous ICT training to healthcare staff can help maintain this level. In addition, 68% (N=23) of staff members who participated in this research study reported that every patient was given his unique ID number and furthermore, 50% (N=17) of staff who participated in the research study reported that sometimes they treated the

patient with same ID number (the same as the one s/he used last time) and about 74% (N=25) who participated in the research study reported that they believed that they checked patients' medical history and used it at each time s/he came to see them. This practice promotes the continuity of patient's healthcare, which is believed to improve data input, the transcription cost reduction, better information sharing, communication referrals, laboratory test order and results sharing, medical prescriptions, drug history; and improved healthcare is ensured through the avoiding of information duplication (26).

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CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

First and foremost, patients who participated in this study reported that the healthcare providers used their stored information in EMR every time they came to see them which can lead to decreased cost which should be incurred by unnecessary duplications and poor knowledge about the available family acceptance and help.

Secondly, the patients who participated in this study reported that believed enough that their healthcare providers communicated with each other through EMR while practicing their job. This can result continuity of care (by avoiding fragmentation of care) and improved patient's satisfaction. The continuous use of EMR important to maintain and improve the connection of healthcare providers one-an-other and efficiently share captured health information in all patients' visits for the continuity of their care.

As a conclusion, if the healthcare staffs have the required ICT skills and if they help their health facility's implementation of one medical patient's file policy to facilitate continuity of care by requesting the patient ID number at every time the patient comes to see them, patients' care will be satisfactory.

6.2. Recommendations

In order to ensure Electronic Medical Record effectiveness on continuity of patient care:

1. The healthcare facility is recommended to train continuously its healthcare staff in ICT
2. The healthcare facility is recommended to have a strong and widespread internet connection throughout the facility environment to help healthcare staff access and use internet wherever and whenever needed.
3. The healthcare staffs are recommended to request the existing patient ID number at every time the patient comes to see them and avoid creating new ones.

6.3. Research questions arising from this study which need to be investigated in future researches

This particular study specifically examined the experiences of patients when utilizing EMR, the way healthcare providers communicate with each other through EMR while practicing their job and continuity of care within one healthcare facility. There is, therefore, a need to evaluate

continuity of care across all healthcare facilities in Rwanda. In fact, patients' past medical history use should not be limited to one healthcare facilities, but rather, should be available wherever the patient seeks medical care across the all healthcare facilities operating in Rwanda.

Therefore, the following research questions needs to be answered:

1. How can the patient use one I.D number across all the EMR systems available in Rwanda?
2. How can the patient use one I.D number across all the healthcare facilities available in Rwanda?

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APPENDICES

Appendix I: QUESTIONNAIRE

CONTINUITY QUESTIONNAIRE

Note: This questionnaire was adopted from the original Nijmegen Continuity Questionnaire (NCQ), which is developed by the Department of Primary and Community Care, Radboud University Nijmegen Medical Centre, Nijmegen (37). The researcher sought and was granted the approval to adopt the questionnaire (See appendix II).

We are interested in hearing about your experience with the healthcare providers that you have come in contact with over the past 12 months.

This questionnaire includes 12 statements and will take about 5-8 minutes to complete. There are no rights or wrong answers; your honest opinion is what counts.

For each statement, please choose the answer that best describes your opinion.

The information you provide will be kept completely confidential. Your answers will not be passed on to your care providers or others.

PART A: PATIENTS' EXPERIENCES

Section 1: patients' consultation history

Age:	Below 20 years	Between 20-50 years	Above 50 years
Number of healthcare visits/12 months: Inshuro waje kwivuriza mu bitaro mu mezi 12 ashize:	2 visits	3 visits	>=4 visits
Number of healthcare provider consulted Umubare w'abaganga wivujeho	1	2	>= 3
Number of departments visited Umubare wa serivisi wivurijemo	1	2	>= 3

Section 2: The following statements are about your (own) healthcare provider

If you have not seen your healthcare provider these past 12 months, please skip to the next section

No	Statement	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	I know my healthcare provider very well Umuganga umvura muzi neza					
2	My healthcare provider knows my medical history very well Umuganga umvura azi neza uko nsanzwe nivuza ntagombye kubisubiramo					
3	My healthcare provider always remembers what he/she did during my last visit(s) Umuganga umvura buri gihe aba yibuka uko yamvuye ubushize ntagombye kubisubiramo					
4	My healthcare provider knows my family circumstances very well Umuganga umvura azi neza imimerere yo mumuryango wanjye					
5	My healthcare provider knows what I do in my day-to-day life very well Umuganga umvura azi neza ibyo nkora mubuzima bwa buri muni					
6	My healthcare provider contacts me when necessary without me having to ask him/her to do so					

	Umuganga umvura amvugisha igihe bibaye ngombwa ntagombye kubimwibutsa cg kubimusaba					
7	My healthcare provider knows very well what I think is important when it comes to my care Umuganga umvura azi neza ibyo mpa agaciro mu kwivuza kwanjye					
8	My healthcare provider maintains enough contact with me when I am seen by other care providers Umuganga umvura akomeza kunkurikirana niyo ndi kuvurwa n'abandi baganga					

Section 3: The following statements are about how healthcare providers in general practice work together (e.g.: your healthcare provider in this department and others from other departments)

If you have not consulted any other healthcare provider apart from the one in this department, you are done with the questionnaire.

N o	Statement	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	These care providers pass on information to each other very well Abaganga bamvura bahanahana amakuru neza cyane					
2	These care providers work					

	together very well Abaganga bamvura bafitanye imikoranire myiza cyane					
	The care given by these care providers is well-connected Ubuwuzi aba baganga bamvura bampa buba bufitanye isano					
4	These care providers always know very well what the other care providers have done Aba baganga bamvura buri gihe buri wese yita ku uko mugenzi we amvura					
5	Any comments/remarks/ andi makuru watanga cg ikindi wavuga:					

Thank you/ Murakoze cyane!

PART B: HEALTHCARE PROVIDERS' EXPERIENCE

Note: This questionnaire was adopted from the original questionnaire which was used in the article: *Factors to Overcoming Barriers Affecting Electronic Medical Record Usage by Physicians* Ankit Singh, Sammita Jadhav, Roopashree M. R Hospital and Healthcare Management, Symbiosis Institute of Health Sciences, Pune, Maharashtra, India. The researcher sought and was granted the approval to adopt the questionnaire (See appendix III).

SECTION ONE: WORK DETAILS

Category of staff (Mark where appropriate):

Nurse/Midwife ☐ Doctor ☐ Allied health professional ☐

Working experience: below 1year ☐ between 1-2 years ☐ above 2 year ☐

SECTION TWO: the level of health facility's implementation EMR (Mark where appropriate):

No	Statement	Agree	Disagree	Do not know
1	I find EMR system easy to use and it also helps me improve my clinical performance			
2	I feel confident in making clinical decision based on information found on EMR			
3	I have the necessary skills for using EMR			
4	EMR improves the quality of the patient care process			
5	I have no difficulty accessing and using an EMR in the hospital			

SECTION THREE: the level of healthcare providers communication through EMR

(Mark where appropriate):

No	Statement	Yes	No	Don't remember
1	I believe that all patients information is kept in one electronic medical file			
2	Every patient is given his unique ID number			
3	I ask the patient to give me his ID number at each time s/he comes to see me			
4	Sometimes I treat the patient with a different ID number (different from the one s/he used last time)			
5	I believe I check if the patient has only one ID number or more at each time s/he comes to see me			
6	I believe I check patients' medical history and use it at each time s/he comes to see me			
Thank you very much!!!!				

APPENDIX II: CORRESPONDANCE TO REQUEST THE APPROVAL TO ADOPT THE NIJMEGEN CONTINUITY QUESTIONNAIRE

(aucun objet)  Boîte de réception x   



BAGARAGAZA Aimable <amabius01@gmail.com>
À a.uijen ▼

28 oct. 2022 08:42 (il y a 13 jours) ☆ ↶ ⋮

Good morning.

I am writing to request your permission to use the questionnaire which you used in your study entitled: Nijmegen Continuity Questionnaire: development and testing of a questionnaire that measures continuity of care in my master's dissertation at the University of Rwanda, Department of Health Informatics, entitled: **Evaluation of Electronic Medical Record effectiveness on continuity of patient care in health facilities.**

I look forward to hearing from you.

Sincerely,

BAGARAGAZA Aimable
Phone: +250783115296
Whatsapp: +250783115296



Uijen, Annemarie

31 oct. 2022 13:05 (il y a 10 jours) ☆

Dear BAGARAGAZA Aimable, Thank you for your interest in the NCQ. In the attachment you'll find the NCQ. Kind regards, Annemarie Uijen De informatie in dit bericht



BAGARAGAZA Aimable <amabius01@gmail.com>
À Annemarie ▼

31 oct. 2022 13:18 (il y a 10 jours) ☆ ↶ ⋮

Thank you for your reply and your acceptance of my request



Uijen, Annemarie <Annemarie.Uijen@radboudumc.nl>
À moi ▼

31 oct. 2022 13:05 (il y a 10 jours) ☆ ↶ ⋮

 anglais ▼ > français ▼ [Traduire le message](#) [Désactiver pour : anglais](#) x

Dear BAGARAGAZA Aimable,

Thank you for your interest in the NCQ. In the attachment you'll find the NCQ.

Kind regards,
Annemarie Uijen

...

De informatie in dit bericht is uitsluitend bestemd voor de geadresseerde. Aan dit bericht en de bijlagen kunnen geen rechten worden ontleend. Heeft u deze e-mail onbedoeld ontvangen? Dan verzoeken wij u het te vernietigen en de afzender te informeren. Openbaar maken, kopiëren en verspreiden van deze e-mail of informatie uit deze e-mail is alleen toegestaan met voorafgaande schriftelijke toestemming van de afzender. Het Radboudumc staat geregistreerd bij de Kamer van Koophandel in het handelsregister onder nummer 80262783.

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1 pièce jointe • Analyse effectuée par Gmail ⓘ



BAGARAGAZA Aimable <amabius01@gmail.com>

31 oct. 2022 13:18 (il y a 10 jours)



À Annemarie ▾

Thank you for your reply and your acceptance of my request.

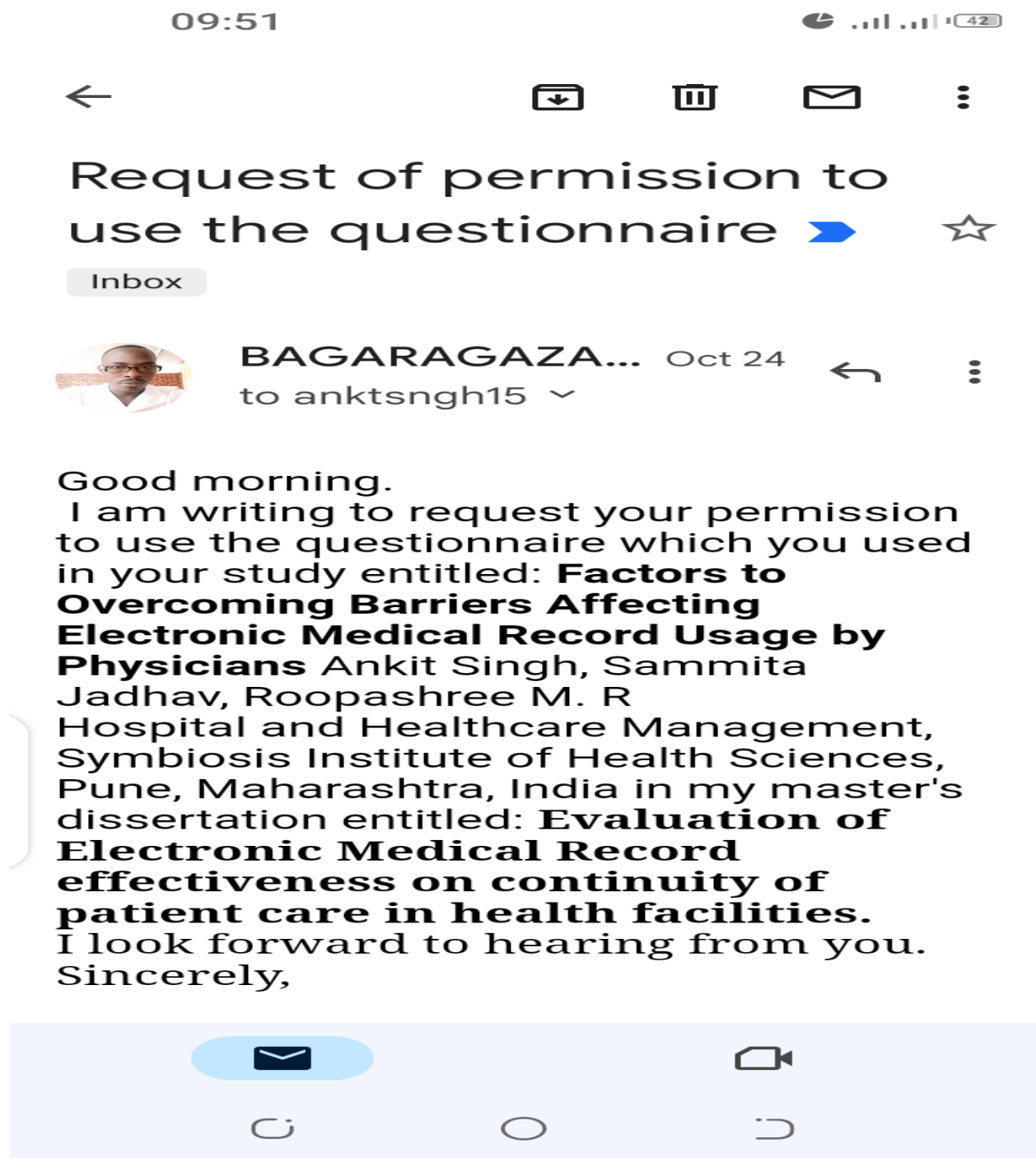
Yours respectfully,



↩ Répondre

➡ Transférer

Appendix III: CORRESPONDANCE TO REQUEST THE APPROVAL TO ADOPT THE STAFF EXPERIENCE QUESTIONNAIRE



09:52

📶 42%



BAGARAGAZA Aimable
Phone:+250783115296
Whatsapp: +250783115296



Ankit Singh Oct 27
to me ✓



Dear Mr. BAGARAGAZA Aimable,
Greetings !

Thank you for showing interest in the
article. Yes , you may use the set of
questions.

[Show quoted text](#)



BAGARAGAZA... Oct 27
to Ankit ✓



Thank you for your response.

[Show quoted text](#)



Appendix IV: CONSENT FORM

Title of the study: Evaluation of Electronic medical Records (EMR) effectiveness on continuity of patients' care in healthcare facilities.

Investigator: BAGARAGAZA Aimable, University of Rwanda; College of Medicine and Health Sciences, Regional Centre of Excellence in Biomedical Engineering and E-Health, Department of Health Informatics.

Introduction:

You are being asked to participate in a research study of **Evaluation of Electronic medical Records (EMR) effectiveness on continuity of patients' care in healthcare facilities**, and you were selected as a potential participant because:

- You have visited Kiziguro Hospital at least two times
- We have been referred to you by your current/former colleague

We are requesting you to thoroughly read this questionnaire and thereafter agree or disagree to participate in the study. In case you agree to participate in this study, we are grateful, and we are requesting you to take the following steps:

- Answer all the questions of this questionnaire
- Provide information to the implementation of EMR and continuity of patient's care

The reading, understanding and answering of the questions takes about 5-8 minutes of your time. We are requesting you to refer us to your colleague whom you feel can participate.

Confidentiality: this study is anonymous. We will not collect or retain any information about your identity.

Right to refuse and/or withdraw

The decision to participate in this study is entirely yours. You may refuse to participate in this study at any time without affecting your relationship with the investigator of this study. In addition, you absolutely have the right not to answer any single question, as well as to withdraw completely from the data collection or completion process at any point during the process.

Furthermore, you have the right to request that the data collector not use any of your data material.

Right to ask questions and report concerns

You have the right to ask questions about this research study, and feel free to contact the principal investigator **Mr. BAGARAGAZA Aimable on his phone number: +250783115296** or Professor Kato J. Njunwa the 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.

Names:

Signature:

Date: