THE DIFFUSION OF ELECTRONIC MEDICAL RECORD TOWARDS UNIVERSAL HEALTH CARE AT THE OUTPATIENT DEPARTMENT IN SELECTED PUBLIC HEALTH FACILITIES IN KENYA

MARYANNE WANJUHI MURITU (Bsc.HRIM)
Q141/CE/26174/2014

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university or for any other award.

Signature..... Date 31/1/2025

Maryanne W. Muritu; Q141/CE/26174/2014
Department of Health Management and Informatics

SUPERVISORS

We confirm that the work reported in this thesis has been carried out by the candidate under our supervision as the University Supervisors

Signature..... Date 31/1/2025

Dr. George O. Otieno
Department of Health Management and Informatics
Kenyatta University

Signature..... Date 04/02/2025

Dr. Kenneth Rucha
Department of Health Management and Informatics
Kenyatta University

DEDICATION

This work is dedicated to my parents the late Mr. Muritu and Mrs. Emmah Muritu and to my children Sally, Abigael and Joshua.

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DEFINITION OF OPERATIONAL TERMS

Diffusion of EMR	The spread of the use of electronic Medical Records technology widely by different populations.
Electronic Health Records	EHR is an electronic version of a patient medical history that is maintained by the provider overtime, and may include administrative clinical data relevant to that persons care under a particular provider, including demographics, progress notes and medications.
Electronic Medical Record	EMRs are a digital health system containing patient's medical record stored on a computer for easy access. They are the same as paper charts and include the patient's complete medical history, treatment plan, diagnoses, prescriptions, and various other health related information.
Technology Diffusion	Technology diffusion is the process by which innovations are adopted by population overtime.
Technology use	The active appropriation and application of technology tools beyond their prescribed or imagined uses.
Universal Health Care	Universal Health Care is a health care system that provides health care and financial protection to all citizens of a particular country.

Outpatient Department	Outpatient department is the part of a hospital designed for the treatment of outpatients, people with health problems who visit the hospital for diagnosis or treatment, but do not at this time require a bed or to be admitted for overnight care.
Public Health Facility	Public Health Facility also called government hospital. It is a hospital which is owned by a government and receives government funding. In some countries, this type of hospital provides medical care free of charge, the cost of which is covered by the funding the hospital receives

.

ABBREVIATION AND ACRONYMS

AAHBH	Addis Ababa Health Bureau Hospitals
CDC	Centre for Disease Control
CRH	County Referral Hospital
HER	Electronic Health Records
EMR	Electronic Medical Records
EMRT	Electronic Medical Records Technology
HCW	Health Care Workers
HIT	Health Information Technology
HIPAA	Health Insurance Portability and Accountability Act
HIE	Health Information Exchange
IDA	International Development Association
ICT	Information and Communication Technologies
IFAD	International Fund for Agricultural Development
KDHS	Kenya Demographic and Health Survey
KNBS	Kenya National Bureau of Statistics
LAN	Local Area Network
MOH	Ministry of Health
NACOSTI	National Council for Science, Technology, and Innovation
PBMR	Paper Based Medical Record
PERT	Performance Evaluation Review Technique
SCH	Sub County Hospital
SPSS	Statistical Package for Social Sciences
WHO	World Health Organization

ABSTRACT

Healthcare organizations are increasingly adopting electronic Medical Records(EMR) as a means to enhance their services and mitigate rising costs associated with the pursuit of Universal Health Care. The diffusion of EMR in public health facilities has become a pivotal aspect of modern healthcare systems globally. There is a significant increase in countries with significant diffusion of EMR, with over half of WHO Member States now having an EMR framework that aligns with UHC objectives. In Kenya, the diffusion of EMR in public healthcare facilities has exhibited a comparatively slow pace of adoption. The problem of slow diffusion has arisen as a notable barrier within the healthcare industry in Kenya. The current investigation was guided by the diffusion of innovations theory which seeks to explain how, why and at what rate new ideas and technology spread. The principal objective of this study was to evaluate the extent of EMR diffusion in Nyeri County Referral Hospital, Thika Sub County Hospital, and Mbagathi Sub County Hospital. The study utilized a hospital based descriptive design, incorporating simple random and proportionate sampling techniques. The study's target population comprised health records and information officers, physicians, nurses, administrators, and other personnel directly engaged in the utilization of electronic medical records (EMR). A sample size of 285 participants was chosen for the study. The process of data collection encompassed the utilization of a meticulously designed questionnaire and the conduction of Key Informant Interviews (KIIs). The data was subjected to analysis using SPSS version 26.0. At least 160 (56.1%) of health facilities partially adopted electronic medical record between different departments, however, the diffusion varied with functions with the registration of patients being the most EMR reliant services, which was reported by 65.7% of the respondents. Working experience (χ^2=15.301; df 3; p=0.018), lack of training (χ^2=10.919; df 4; p=0.031), lack of effective leadership (χ^2=8.062; df 4; p=0.041), adequacy of technical skills on IT systems (χ^2=11.508; df 4; p=0.025), level of computer literacy (χ^2=6.562; df 4; p=0.044), understanding of working with EMR system (p=0.0001), assigning EMR security privileges to staff (p=0.046), and lack of adequate infrastructure (χ^2=7.879; df 2; p=0.046) were affecting diffusion of EMR. Additionally, inadequate sources of funding (χ^2=9.186; df 2; p=0.017), lack of technical personnel to install and operate EMR technology resources (χ^2=8.615; df 2; p=0.042), the consistency rate of internet connection (bandwidth) (χ^2=14.882; df 2; p=0.005), lack of training new hospital staff on EMR usage & operations (χ^2=8.170; df 1;p=0.019), lack of technical personnel to install and operate EMR technology (χ^2=10.071; df 1; p=0.015), absence of computer skills amongst health care staff (χ^2=7.404; df 1; p=0.038), and inadequate internet bandwidth (χ^2=9.504; df 1; p=0.032) were affecting diffusion of EMR. Thus, the hospital management should improve the diffusion of EMR from one department to another, more training should be undertaken, and the county governments should strengthen organizational resources to support information use.

CHAPTER ONE: INTRODUCTION

1.1 Introduction

The chapter contains background of the study, problem statement, justification of the study, objectives of the study, research questions, limitations and delimitations of the study, and the conceptual framework.

1.2 Background Information

Electronic Medical Record (EMR) is a digital system that functions as a centralized storage for patient information, enabling its convenient retrieval and dissemination among different entities, such as healthcare providers, insurance providers, and within a healthcare organization (Chaudry, 2021). The phenomenon of EMR diffusion pertains to the widespread and consistent adoption of EMR technology among diverse populations (Hsiao, 2019). The diffusion of EMR in developed countries has been a significant advancement in healthcare technology, aimed at improving patient care, enhancing data management, and increasing healthcare efficiency (WHO, 2016).

In developed countries, diffusion of EMR systems have seen substantial growth, particularly in the United States and Australia (Akinyele et al., 2019). Some study highlighted that the diffusion rates among general practitioners in several European countries are notably high, with percentages such as 90% in Sweden and 88% in the Netherlands (Derecho KC, 2024). The implementation strategies often involve comprehensive training programs and established frameworks that facilitate smoother transitions from paper-based records to electronic systems (Derecho KC, 2024).

The diffusion of Electronic Medical Records (EMR) in public health facilities has become a pivotal aspect of modern healthcare systems globally (WHO, 2016). A 2015 WHO survey indicated a significant increase in countries with significant diffusion of EMR, with over half of WHO Member States now having an EMR framework that aligns with UHC objectives (WHO, 2016). This trend underscores the crucial role that digital health solutions play in expanding healthcare access, improving service delivery, and ultimately achieving equitable health outcomes for all populations globally (WHO, 2016).

In the past quarter-century, there has been a persistent evolution in the provision of public healthcare services (Angst et al., 2022). Advancements in the field of medicine, as well as in information and communication technologies (ICT), have led to the emergence of novel approaches and prospects for facilitating and potentially facilitating novel forms of healthcare services (Lium, 2020). The aforementioned modifications encompass the utilization of novel information and communication technologies with the aim of enhancing patient services, expediting waiting times, and resolving structural issues within the healthcare system (Overton, 2019). Blumenthal and Tavenner (2022) assert that the diffusion rates of innovations typically experience acceleration when they reach a range of 10-20 percent of the population. This observation holds true for the diffusion of Electronic Medical Records (EMR) as well.

Lium (2020) posited that the integration of information technology within healthcare establishments in the United States yielded improvements across multiple dimensions of healthcare, encompassing patient safety, efficacy, patient-centricity, timeliness, efficiency, and equity. According to a survey conducted by the Japan Hospital

Association (JHA) in 2021, a majority of hospitals in Japan have implemented EMR. However, it was found that only 30% of these hospitals identified the high cost of computerization as the main obstacle to diffusion of EMR (Overton, 2019). Blumenthal and Tavenner (2022) also reported that the rate of EMR diffusion in small hospitals in South Korea was 40.3%, a figure that slightly surpasses that of neighboring Japan.

In a study conducted by Akinyele et al. (2019) in India, it was observed that the implementation of EMR has the potential to enhance healthcare efficiency. However, several barriers hinder it's the diffusion among healthcare practitioners, including cost implications, time constraints, inadequate training, apprehensions regarding security and privacy, and the absence of standardized protocols (Lium, 2020). According to Akinyele et al. (2019), the diffusion of EMR has resulted in a decrease in waiting time, enhanced accessibility to healthcare services in remote and rural areas, and improved practices related to chronic disease management and prescription.

The first electronic medical record (EMR) system used for the comprehensive and clinical care of HIV-infected patients in sub-Saharan Africa was the Academic Model for the Prevention and Treatment of HIV (AMPATH) Medical Record System (AMRS) in Kenya (Overton, 2019). Research conducted in multiple developing nations, such as Mozambique, South Africa, and Mongolia, indicates that the diffusion of EMR is constrained (Akanbi M. et al, 2019). According to health workers stationed at health centers in these nations, it is observed that Health Information Systems (HISs), including Electronic Medical Records (EMRs), are primarily utilized as instruments for upward reporting, specifically for the purpose of reporting to governmental authorities (Akanbi M. et al, 2019). According to Akinyele et al. (2019), the tools do not serve the purpose of

aiding clinicians, specifically physicians and nurses, in their decision-making processes pertaining to patient monitoring and disease management. According to Mugo and Nzuki (2019), these diffusion of technologies is facilitating individuals' access to advancements in healthcare and fostering favorable dispositions towards the management of their medical data.

In their 2019 study, Mugo and Nzuki examined the numerous challenges associated with the delivery and management of healthcare services in the majority of Sub-Saharan African countries. Implementers of healthcare information technology-based solutions in numerous countries encounter a multitude of intricate challenges, including insufficient funding, limited resources, and a fragile healthcare infrastructure (Mwangi, 2020). According to Mugo and Nzuki (2019), the diffusion of electronic medical records (EMR) offers the potential for expedited retrieval of health information, resulting in enhanced healthcare outcomes and optimized resource allocation. According to Mulwa (2020), the health systems of developing nations are insufficient to meet the demands placed upon them. Despite extensive research conducted in the field of information technology, the rate of diffusion has shown limited progress.

Research utilizing Rogers' diffusion theory has highlighted that user satisfaction and the perceived benefits of EMR systems, such as reduced medication errors and improved patient management, are crucial for fostering acceptance of EMR among healthcare professionals (Rogers E., 2003). In a study conducted in Korea, high intention-to-use scores among doctors and nurses were linked to factors like user training and mandatory system use, indicating that engagement and education are vital for successful diffusion of EMR (Angst et al. (2022).

The diffusion of Electronic Medical Records (EMR) in public health facilities in Kenya presents a critical area of study, particularly given the country's ongoing efforts to enhance healthcare delivery through technology (Chepkwony, 2019). Despite the rapid growth of information and communication technology (ICT) in Kenya, the penetration of EMR systems in public hospitals remains relatively low (Chepkwony, 2019). Research indicates that while there have been significant strides in the implementation of EMR for specific health programs, such as those targeting HIV treatment, broader diffusion across various health departments has not yet materialized (Haskew J.et al , 2019).

1.3 Statement of the Problem

The diffusion rate of EMR technology is significantly slower in comparison to other information technology (IT) advancements across diverse industries (Kalayou, 2020). The concept of EMR can be elucidated through the lens of diffusion of innovations theory which seeks to explain how, why and at what rate new ideas and technology spread. Globally, the rate of diffusion in physicians' offices ranges from 10 to 16 percent, depending on the specific measures used (Mugo & Nzuki, 2019). In order to expedite the diffusion of EMR, it is imperative to establish suitable incentives that facilitate their effective utilization.

The acceleration of the diffusion of EMR can potentially yield advantages, contingent upon the existence of additional factors such as competitive advantage and regulatory frameworks (Lluch, 2019). Although EMR serves as a catalyst for transforming the manner in which tasks are executed, studies in the United States, indicate numerous

challenges encountered in its diffusion, with healthcare professionals, including doctors and caregivers, exhibiting reluctance to fully embrace these systems (Lium, 2022).

The diffusion of EMR in public health facilities in Kenya represents a critical pathway towards achieving Universal Health Coverage (UHC). Despite the potential benefits of EMR systems, such as improved patient care, enhanced data management, and streamlined healthcare processes, their diffusion in Kenyan public hospitals has been notably slow (Akinyele et al., 2019). Research indicates that while there has been some progress, particularly in HIV treatment programs supported by donor initiatives, the overall integration of EMR systems across various health conditions remains limited (Akinyele et al., 2019). Similarly, Research indicates that a significant proportion of hospitals, even those that have made concerted efforts to diffusion of EMR, experience a substantial rate of failure. Studies suggest that the failure rate of EMR implementations can reach as high as 80% (Mugo & Nzuki, 2019).

Many public facilities in Kenya still rely heavily on paper-based records, which hampers their ability to provide timely and comprehensive health information necessary for effective service delivery and monitoring health outcomes. Although there is an existing EMR system in Nyeri CRH, Mbagathi SCH, and Thika SCH, there have been many challenges affecting its diffusion in all departments of the facilities. EMR is mostly operational in the outpatient department, which cannot communicate to pharmacy or laboratory on the same patient. This lack of communication means that diffusion is taking time in public facilities, unlike in private facilities.

Key strategies have been implemented by the Kenyan government to facilitate the diffusion of EMR, including the establishment of standards and guidelines. However, challenges such as insufficient infrastructure, lack of user training, and inadequate management commitment continue to hinder widespread diffusion. This study aims to explore the current state of EMR diffusion in public health facilities in Kenya, examining the strategies employed, the barriers faced, and the opportunities that exist to enhance the diffusion of EMR systems. By identifying these factors, the research seeks to contribute to the discourse on how EMR can be effectively leveraged to support the overarching goal of UHC in Kenya.

1.4 Justification of the Study

The digitization of health information in the health care industry commenced more than ten years ago (Akinyele et al., 2019). The development of Health Information Technologies (HITs) has been significantly influenced by the advancements in internet and computer systems. According to Babbott et al. (2020), the diffusion of EMRs has resulted in a transformation in the way patient health records are managed. Organizations require innovation in order to maintain competitiveness, yet they often exhibit skepticism when faced with uncertain outcomes.

The diffusion of EMR in public health facilities in Kenya is a crucial step toward achieving UHC (Perera et al, 2019). With the increasing demand for efficient healthcare delivery, the integration of EMRs can significantly enhance patient data management, streamline healthcare processes, and improve overall health outcomes (Mugo and Nzuki, 2019). Despite the rapid growth of information and communication technology (ICT) in

Kenya, the diffusion penetration of EMR in public hospitals remains low, primarily due to challenges such as inadequate infrastructure, limited user training, and insufficient management commitment (Mugo and Nzuki, 2019).

The importance of EMRs in promoting UHC cannot be overstated. A well-implemented EMR system can support comprehensive patient care by providing healthcare providers with timely access to patient information, which is essential for informed decision-making (Caine & Hanania, 2019). Moreover, EMRs can enhance data accuracy and facilitate better monitoring of health trends, thereby enabling health authorities to allocate resources more effectively (Ajami and Bagheri-Tedi, 2020). In Kenya, where healthcare facilities often rely on paper-based records, the transition to EMRs is vital for improving health service delivery and ensuring that all individuals have access to necessary health services (Haskew J., 2019). By examining the current state of EMR diffusion in public health facilities, this study sought to contribute valuable insights that could inform policy and practice, ultimately supporting the achievement of UHC in Kenya.

Nyeri, Thika, and Mbagathi hospitals exhibited a sluggish diffusion of EMR across their various departments, despite their status as high-volume healthcare facilities equipped with established organizational structures. These hospitals represent a mix of urban and semi-urban settings, providing a comprehensive view of EMR diffusion across different contexts. Thika Level 5 serves a rapidly growing urban population, while Nyeri Provincial General Hospital caters to both urban and rural patients. Mbagathi Hospital, located in Nairobi, offers insights into the challenges faced in a metropolitan area. Each of these hospitals has made strides towards implementing EMR systems, albeit at varying levels of success in diffusion.

The findings of this study held significance for both national and county governments, as well as have a social impact in addressing the obstacles associated with the implementation and diffusion of EMR within the healthcare sector. This knowledge is essential for policymakers and healthcare leaders aiming to enhance the effectiveness of health systems in Kenya and ensure that all citizens can benefit from improved healthcare services. The study sought to inform policies and decisions that could accelerate diffusion of EMR in public health facilities.

1.5 Research Questions

1. What is the level of EMR diffusion in Nyeri, Thika, and Mbagathi hospitals in Kenya?
2. What are the health workers characteristics affecting the diffusion of EMR in Nyeri, Thika, and Mbagathi hospitals in Kenya?
3. What are the organizational factors influencing EMR diffusion in Nyeri, Thika, and Mbagathi hospitals in Kenya?
4. What are the technological factors influencing the diffusion of EMR in Nyeri, Thika, and Mbagathi hospitals in Kenya?

1.6 Objectives of the Study

1.6.1 Broad Objective

To assess the diffusion status of Electronic Medical Records at selected public health facilities in Kenya

1.6.2 Specific Objectives

1. To establish the level of technology diffusion in Nyeri, Thika, and Mbagathi hospitals in Kenya
2. To describe individual characteristics affecting the diffusion of EMR in Nyeri, Thika, and Mbagathi hospitals in Kenya
3. To determine organizational factors influencing EMR diffusion in Nyeri, Thika, and Mbagathi hospitals in Kenya
4. To identify technological factors influencing the diffusion of EMR in Nyeri, Thika, and Mbagathi hospitals in Kenya

1.7 Significance of the Study

It was hoped that this study would be a critical contribution to the practice, research, and theory of health development and the body of knowledge of professional medical operations. The study provided health practitioners, consultants, and academia with facts and data that led to scholarly publications and reference material. Scholars and researchers, therefore, found information and data from this study as a basis for further research. The study also contributed immensely to the theory and body of knowledge on health information management discipline. The study further made an insightful contribution to university teaching. The new knowledge generated through this study benefited funding agencies, county governments, hospital administrators, policymakers, and health practitioners.

1.8 Limitations and Delimitations of the Study

Health care workers are very busy people, thus the researchers faced a few challenges when engaging staff to fill questionnaires. To overcome these challenges, the study adopted the drop-and-pick method to give the staff time to fill their questionnaires. The study only included the staff working with EMR for more than six months in the selected facilities. The result of this study only depicts the picture of the selected facilities. Different health care facilities have different operating environments, and hence, there is need to generalize findings of this research with a lot of caution.

1.9 Conceptual Framework

The independent variables of the study were the socio-demographics; indicated by age, gender, religion, level of education, profession, and work duration. Other independent variables were level of technology use, individual characteristics, organizational factors, and technology use factors. Level of technology use was indicated computer literacy, training, and the number of computers. Different components were indicated by attitude, EMR acceptance, and EMR usability. Organizational factors included technical, financial, available resources, change resistance, and policies. Technology factors included electronic data exchange, availability of WAN/LAN, internet speed, user support, and privacy and security. The intervening variables were the geographical location of the facility, perceived usefulness, health information management policies, as well as the county government health management bill. The dependent variable was the diffusion of EMR, which was indicated by the number of departments consistently using EMR, extent, and competence of using the system.

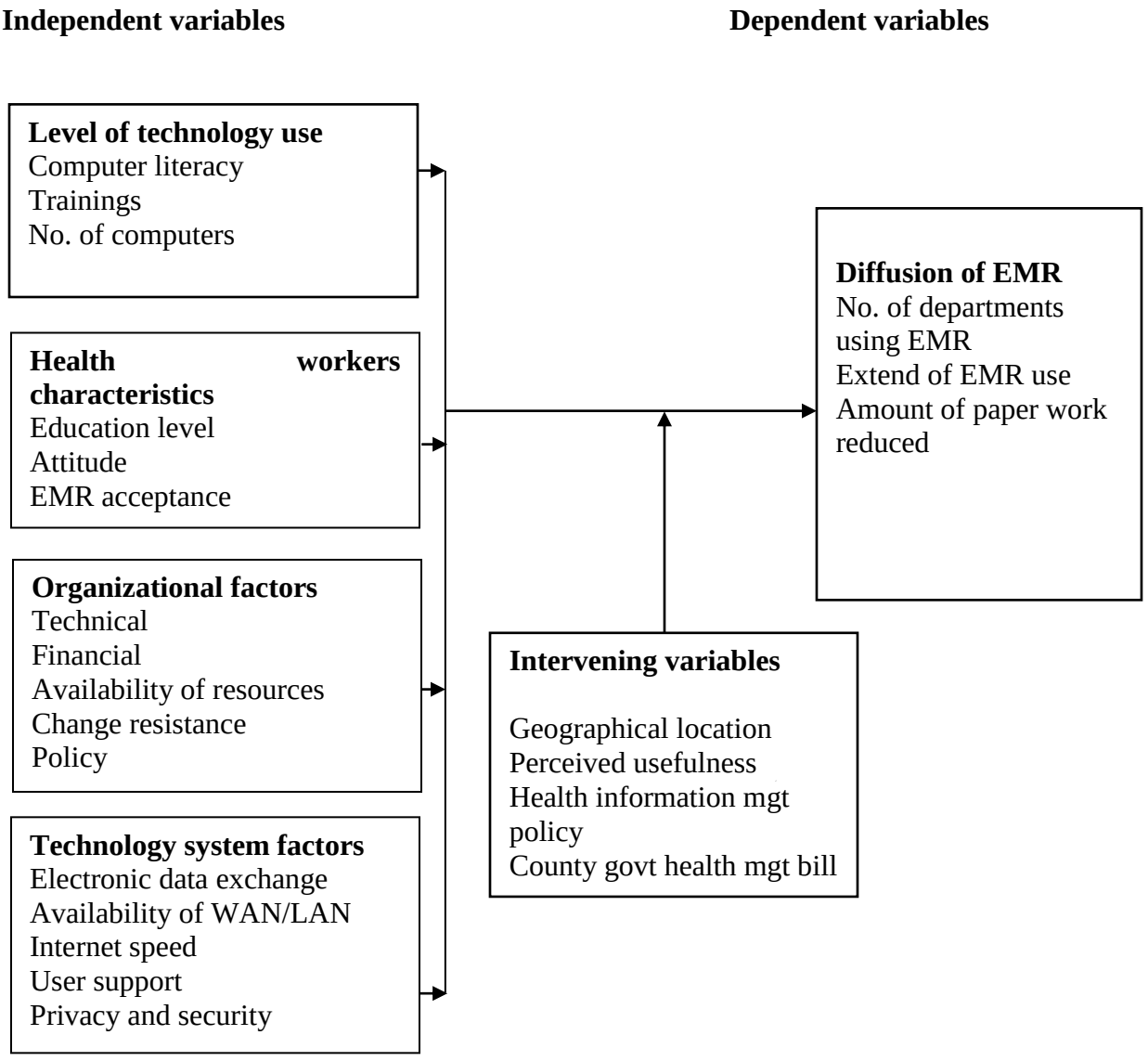


Figure 1.1: Conceptual Framework

Adopted and modified from Angst *et al.,* (2022); Perera *et al.,* (2019) and Babbott *et al.,* (2020)

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter contains a critical review of the current literature about the study topic. The section comprises diffusion of electronic medical records technology in health institutions, level of technology use, individual factors, organizational factors, and technological factors influencing of diffusion of EMR.

2.2 Diffusion of Electronic Medical Records Technology in Health Institutions

Electronic medical records originate from paper-based patient records, are often considered a part of more extensive data management systems, and are designed to store, manage, and query various medical data (Mwangi, 2019). EMR are one of the foundational but controversial technologies for the digitization of health care (Ajami & Bagheri-Tadi, 2020). Different terms are used interchangeably to refer to these systems including electronic patient record (EPR), Electronic Health Records (EHR) electronic medical record (EMR), computer-based patient record (CPR) and medical records system (MRS) (Lium, 2020; Blumenthal & Tavenner, 2022).

An EMR is a digital repository of patient data that is shareable across stakeholders, such as clinicians, insurance companies, employers, and within a hospital and health system (Mugo & Nzuki, 2019). The EMR has been characterized as one of the significant innovations to emerge in the health-care industry in recent years (Babbott *et al.*, 2020). EMR offers the promise of unifying fragmented data and applications and allows the practice and administration of medicine to incorporate more evidence-based decision making (Akinyele *et al.*, 2019). EMR integrate various tools that could improve clinical

decisions and thus favors a safer, more effective, and more efficient healthcare system (Jawhari *et al.*, 2021).

Although EMR has many advantages over paper records, its diffusion in healthcare has been slow. A survey conducted by the Japan Hospital Association (JHA) (Japan Hospital Association, 2001) reports that only 30% of hospitals in Japan have adopted EMR and cites the high cost of computerization as the significant barrier to EMR diffussion (Otieno & Hosoi, 2019). Some European countries, such as the Netherlands, report over 90% use of EMRs by primary care physicians, the situation in Canada is very different (Caine & Hanania, 2019). Though the technology has been available commercially for over three decades, studies show that its diffusion rates are consistently below 30%, with some estimates as low as 7.6% for an essential electronic health record (EHR) system (Overton, 2019). The findings indicate that underscoring the uncertainty hospitals confront in their decision to acquire the innovation (Perera *et al.*, 2019), EMR systems have various benefits and advantages in healthcare practice. In India, McCarty *et al.*, (2019) denote that EMR has the potential to improve patient care by managing patient's medical and personal information efficiently and effectively.

2.3 Level of Technology Use

The full diffusion of EMR make IT a critical component of helping hospitals to deliver health care (Gaponova, 2019). However, Mwangi (2019) argues that a lack of technical skills is one of the barriers to full diffusion of EMR in health care settings. According to Al Aswad (2019), a certain level of computer skills is required to master the complexity of hardware and software of the EMR system. Akinyele *et al.,* (2019) states that EMR

vendors may have underestimated the level of technical skills required by clinicians to master the use of the technology.

Al Aswad (2019) argues that clinicians' lack of technical knowledge to deal with EMRs may have contributed to their resistance to adopting the system thus affecting its diffusion. Some physician practices that have adopted EMR stated that going from Paper Based Medical Records (PBMR) to EMR was hard and challenging initially, but none of those practices was ready to go back to using PBMR (Chepkwony 2019). According to Mugo & Nzuki (2019), these practices considered the readily available information of records in the EMR system as beneficial to their settings.

Lium (2020) echoes the difficulty of using EMR, stating that, after initial installation, it could take up to 1 year to reach a stable diffusion of the system. There are three legislations (use of evidence-based learning, training, and change management support) stipulated by the Health Information Technology for Economic and Clinical Health Act (HITECH Act) (Wilke *et al.*, 2019). The training was cited as very difficult for clinicians because of the complexity of deploying EMR (Wilke *et al.*, 2019). The authors further argue that a scenario in which busy clinicians are being trained for several hours with a system that is unrelated to their practices could be challenging.

Despite the numerous studies which have been done on the level of technology use about the diffusion of EMR, there was a knowledge gap in Kenya. The knowledge gap was because there were no published data on the extent of technology use in relation to EMR diffusion in the country. The study, therefore, sought to address the knowledge gap by

determining the level of technology use among health care workers at selected public health facilities in Kenya.

2.4 Individual Factors Influencing Diffusion of Electronic Medical Records

A US study with a group of primary care physicians and managers reported the perceptions of primary care physicians, nurses, and physician assistants serving minority populations (Akinyele *et al.*, 2019). Adoption predictors included increasing years since the completion of clinical training, and positive attitudes towards EHRs improved the quality of care. The study suggested that clinicians support the use of IT to enhance the quality in underserved settings, but many felt that it was not currently fulfilling its potential, due to limited use of essential functions within the EMR (Ajami & Bagheri-Tadi, 2020). Implementation of an EMR system suggests that a successful re-design of a clinical workflow to accommodate it, EHR and more intensive EMR use are associated with more exceptional quality of care and financial benefits. Perceived barriers reported by this group were economic costs, disruption of clinical workflow, usability issues, lack of time and support to re-design clinical workflow, and lack of standardization and interoperability (Al Aswad, 2019).

A survey of nurses' perceptions of standardized care plans in EMRs in Sweden revealed several positive attitudes (Overton, 2019). Nurses felt that standardized care plans could facilitate nursing practice by increasing nurses' ability to provide the same high-quality basic care to all patients and decreasing documentation time as well as redundant documentation (O'malley *et al.*, 2022). Overton (2019) highlights the importance of providing nurses with training that will increase their knowledge of standardized care plans and help them better understand evidence-based knowledge. A survey of

emergency nurses and physicians in the US suggests that the main diffusion predictors in this healthcare setting were perceptions of training and support; perceptions of usefulness; effort expectancy; social influence; computer literacy and positive attitudes towards computers (Perera *et al.,* 2019). The authors also reported that many perceptions of the EMR system at launch persisted through the first months of use, suggesting that early positive impressions of training, support, belief and EMR usefulness can maximize its diffusion (Jawhari *et al.,* 2021).

Hasanain *et al.,* (2019) examined health personnel knowledge, acceptance of and preference for EMR systems in seven Saudi public hospitals in Jeddah, Makkah, and Taif cities. Results indicated that there was a highly significant positive relationship between computer literacy and EMR diffusion. There was a significant positive correlation between English language proficiency level and computer literacy and EMR literacy levels. Additionally, the study results show that there is a significant correlation between education level and computer and EMR diffusion. Thus, the use of and preference for EMR systems appears to be related to socio-economic determinants such as educational level, English language proficiency, and computer literacy (Hasanain *et al.,* 2019).

O'malley *et al.,* (2022) attributed slow diffusion of EMR among developing countries to lack of computer skills amongst the clinicians. In states that have assimilated ICT training for clinicians, acceptance of EMR, and actual use is relatively high (Babbott *et al.,* 2020). Training boost awareness and confidence level as users can overcome technophobia while relating usage to expected benefits (Akinyele *et al.,* 2019). Wilke *et al.,* (2019) added their voice by arguing that optimal use of IT towards the transformation of health

care requires IT knowledge in the medical communities. According to Perera *et al.*, (2019), sluggish diffusion of EMR among doctors in Pakistan was due to unavailability of proper technology and lack of computer training.

The correlation between ICT skills and diffusion of EMR is also discussed by Shachak & Reis (2021), who points out that inadequate ICT skills in the health sector in Kenya explains the slow diffusion of EMR. Akinyele *et al.,* (2019) think that those health care professionals who lack the ICT skills of processing the online health data end up spending too much time on the same. McCarty *et al.,* (2019) study found that the staff at the private hospitals had a higher knowledge on the computer than those from the public hospitals. A large proportion of the respondents had access to and knew how to use the EMR applications at a moderate level. Although O'malley *et al.,* (2022) focused on establishing the diffusion of Inter-Organizational Information Systems (IOIS) in Kenyan Universities; their findings that user's ICT skills affect the diffusion of IOIS can be extrapolated to cover health information technologies. Without adequate ICT skills, user involvement in the selection and development of ICTs becomes difficult, and if it happens, it is only to rubberstamp the expert's decisions (Wilke *et al.,* 2019). This could lead to having EMR technologies that are not widely accepted or used adequately.

Different studies point out to the existence of various individual characteristics about the diffusion of EMR. Despite this, there was a knowledge gap on the specific individual factors that determine the uptake of the system in the country. The study, therefore, aimed at understanding the individual characteristics that influence the diffusion of EMR in Kenya.

2.5 Organizational Factors

2.5.1 Financial Factors

Several physicians perceive EMR as hard to use and expensive (Ajami & Bagheri-Tadi, 2020). Electronic medical records adoption costs also seem to affect smaller health care providers more (Beacham, 2021). For this reason, high costs, such as ongoing maintenance make the EMR system riskier for some providers because the costs may be too expensive (Jawhari *et al.*, 2021).

The financial barriers to adopting EMRs are the costs of acquiring and executing EMR systems and the cost of ongoing maintenance and adjusting the workflow to the new technology (Jawhari *et al.*, 2021). Financial barriers also include finding a way to meet the practice's needs, and the product lifecycle (Mwangi, 2020). Other financial barriers are high startup costs, uncertain investment returns, patient and physician visit time costs, lack of technical support, technical difficulty, lack of incentives, and the medical doctor's attitude toward adopting EHRs (Despins & Wakefield, 2022). Concerns about patient health information privacy and security were also barriers for some physicians (Boonstra & Broekhuis, 2022).

2.5.2 Privacy and Security Factors

Authorized users need health information to be readily available (Mwangi, 2020). However, concerns about the safety and confidentiality of a patient's medical information increased with the use of EMR systems (Mugo & Nzuki, 2019). These concerns include preventing unauthorized entrances to a patient's medical record and ensuring patient privacy (Ajami & Bagheri-Tadi, 2020). Physicians should not disclose personal

information to others unless the patient knows and consents to the disclosure. Integrity OF EMR diffusion is necessary because of data impacts and health care quality (Lium, 2020).

There have been numerous debates on the competency of Health Information Portability and Accountability Act (HIPAA) to protect medical information (Shachak & Reis, 2021). There are different stages of privacy threats: (a) guiltless mistakes and accidental discovery caused by insiders, (b) authorized users intentionally accessing information for monetary gain or malice, (c) an illegal intruder, and (d) revengeful workers or intruders who disrupt the organization by mistreating information or destructing systems (Kho *et al.,* (2019). Secondary consumers who receive, process, and obtain health information, such as HIT industries, public health organizations, third-party payers, and insurance corporations also threaten the privacy (Haskew *et al.,* 2019). The efforts of many organizations, both private and public, have identified privacy concerns of personal health information as barriers to the adoption of EHRs and the development of Health Information Exchange (HIEs) (Beacham, 2021). Undoubtedly there is a strong need to keep confidential of a patient's health information (Mugo & Nzuki, 2019). It is clear many challenges curb the diffusion of EMRs.

2.5.3 Change Resistance Factors

During organizational transformation, there is always resistance to change regardless of the business type. A survey done for Spanish companies dealing with the development process, there were 86 valid answers obtained from the study (Blaya *et al.,* 2022). The first groups of experts were university staff, many business people, and three individual

managers. The questionnaire collected data to test the hypotheses (Ajami *et al.,* 2019). The first hypothesis was to examine the observable resistances to change in empirical research. The following hypothesis was to test the resistance to change using strategic or evolutionary changes as a continuum. The authors used strategic and evolutionary to explain the resistance to change: (a) highly strategic is where there has been a radical change, and the company is not same as before, and (b) extremely evolutionary were they modified certain aspects of the organization, and the organization remains the same (Ajami *et al.,* 2019).

Respondents indicated their position among five points of the continuum. The descriptive analysis supported the acceptance of the hypotheses (Angst *et al.,* 2022). Resistance to change is more potent in strategic changes than in evolutionary changes (Ajami *et al.,* 2019). The data suggests radical and transformational change is more resistance and deeply rooted values make the transition difficult for organizations (Akinyele *et al.,* 2019). An influential culture of loyalty and cohesion as fundamental values limits innovation by not allowing the existence of unruly people inside the company (Shachak & Reis, 2021). Miller & Tucker (2021) acknowledges unsuccessful transitions fail during one of the subsequent phases. The first phase would be generating a sense of urgency. The second phase is establishing a powerful guiding coalition. The third phase is developing a vision, communicating the vision. The fourth phase is removing impediments, planning, and producing short-term wins, avoiding premature pronouncements of victory, and the fifth phase is embedding changes in the corporate culture (Boonstra & Broekhuis, 2022).

McCarty *et al.,* (2019) notes that radical transformation creates people issues because of leadership and job changes. Resistance to change can delay or eliminate the success of organizational change, so leaders should address all anxiety issues during the development process (Perera *et al.,* 2019). According to Babbott *et al.,* (2020), resistance happens when people do not understand the change.

Successful change requires (a) unfreezing the present level, (b) moving to a new level, and (c) freezing on a new level (Miller & Tucker, 2021). Change research also reveals many companies have problems achieving change, sustaining change, and un-anchoring old ways to make room for innovation (O'malley *et al.,* 2022). Change in organizational structures, policies, and processes cause resistance (Wilke *et al.,* 2019). Organizations must understand there is a need or change for change to be successful, or transformation becomes difficult if there are few needs. If there are high needs, then there is little or no resistance when initiating change (Shachak & Reis, 2021). Change creates tension and resistance. Kho *et al.,* (2019) allege that people have to participate, organizations have to reeducate, and new behaviors have to become the norm for the development to be sustainable. Andrews (2021) notes that successful development depends on collaboration and effective communication between those who have a stake in the outcome and engage directly in development efforts.

Regardless who initiates change, it cannot take place unless everyone is on board. Richardson (2021) articulates that the pressure to change comes from several positions, and not just leaders. Organizations fail to understand the benefits of implementing new IT because of the implementation barriers. New technology benefits the company in the long

run, but its effects of development in the short-term causes resistance to organizational structure, policies, and business processes (Ludwick & Doucette, 2021). Mwangi (2019) articulates that insufficient IT adoption strategies may result in low diffusion rates, ongoing issues during IT implementation, which includes slow and ineffective diffusion because users experience technical difficulties. It also may result in negative user's perceptions towards using IT and lead to resistance. Organizations that lack articulated IT adoption policies may face numerous implementation problems (Mwangi, 2019).

Literature review from various sources indicates the existence of different organizational factors about the diffusion of EMR. However, there was a knowledge gap in the specific organizational predictors that influence the diffusion of EMR in Kenyan hospitals. The study, therefore, sought to address the organizational factors by studying the issue in selected health facilities in the country.

2.6 Technological Factors Influencing the Diffusion of Electronic Medical Records

EMR sustainability require more than physicians to survive (Miller & Tucker, 2021). All healthcare workers play a vital role in the management of health care records. Health care workers enables healthcare sector to move into the new roles of informatics and specialize in computer technology and utilize their past clinical expertise to bridge the gap of computer and clinician (Al Aswad, 2019). These specialists make an overwhelming contribution to the medical profession, by translating reports and assisting other physician and hospital administration in the meeting the requirements of improved quality care (Agha, 2019; Blumenthal & Tavenner, 2022).

Today the majority of hospital management has incorporated informatics classes for new employees and refresher courses for all older staffs (Angst *et al.,* 2022). Informatics Specialists (IS) are a vital piece of the sustainability puzzle because they provide the most substantial amount of documentation in health care. Nurses use their skills to assess, plan, intervene, and evaluate their patients. Nurses are concerned about the time the EMR will require. The nurses fear that the EMR may take valuable patient–care time from their patients (Boonstra & Broekhuis, 2022). Healthcare workers must understand the boundaries and capabilities of the EMR to assist their clinical colleagues with the necessary help for the successful diffusion of the EMR system.

Improved care and fewer medication errors are critical to the sustainability of EMR, but the protection of patient's privacy is just as important (Akanbi *et al.,* 2019). Placing citizens' private health information in one location creates a risky operation. Many developing countries suffer from health worker migration as doctors and nurses head to more affluent countries such as the UK, US, and Canada (Abimbola, 2019). Hence, there is an urgent need to improve the skills of existing staff at a fast pace, at low cost, and as close to their place of work as possible (Hasanain, 2022). Policies and standards that regulate EMR ought to be supported and well-coordinated to improve chances sustainability. The government should work to lessen network externalities, which should lead to more diffusion of EMR. Although there is extensive knowledge of the influence of technological systems on diffusion of EMR in developed countries, there exists a knowledge gap on the topic in the country. This study therefore, aimed at addressing the gaps by studying the phenomenon in the country.

2.7 Summary of the Literature Review

The chapter reviewed the literature on the various factors that influence the diffusion of EMR, which included; the level of technology use, individual characteristics, organizational factors, resource availability, and technological factors. Electronic technologies are a reality of life in the 21st century. They bring a range of benefits to governments, organizations, and society, including improved communications, increased efficiency, and greater accountability and transparency. Records professionals must not turn their back on the difficulties of implementing electronic records management programs. Instead, they must use the opportunities presented by digital technologies to improve the framework for all records management. Toward this end, it is crucial to bear in mind that electronic records are entirely dependent upon technology.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter describes the methods which were used to provide answers to the research questions. It focused on research design, target population, sampling procedure, data collection methods, validity, reliability, methods of data analysis, operational definition of variables, and ethical issues.

3.2 Study Design

The study was a hospital based descriptive design to gather and analyse information to systematically describe the state of affairs as they exist at present in which the researcher administered questionnaires to the participants. Kothari (2004) describes descriptive investigations as formalized and typically structured fact-finding inquiries, involving asking questions (often in the form of a questionnaire) of a group of individuals, adding that the principal purpose is a description of the state of affairs as it exists at present and represent the findings statistically.

3.3 Variables

3.3.1 Dependent Variables

The dependent variable was the diffusion status of EMR, which were measured by the degree of technology use on EMR system in the health facility.

3.3.2 Independent Variables

The independent variables were the level of technology use, which is an enabler of the outcome, individual characteristics, organizational factors, and technological factors affecting technology diffusion, which were measured by the level of utilization, system stability, and acceptability.

3.4 Study Area

The study was carried out in Nyeri County Hospital, Thika Sub County Hospital, and Mbagathi Sub County Hospital, which have established and had working EMR systems. Nyeri county is within the central region of Kenya and covers an area of 13,191 km^2 located to the north of Nairobi and west of Mt. Kenya. The climate of Central region is generally cooler than that of the rest of Kenya, due to the region's higher altitude. Rainfall is relatively reliable, with main economic activities being farming and agricultural processing, particularly in cooking oils (to the rest of Kenya and eastern Africa), a key producer of coffee (exports mainly to the United States and Europe), horticulture and pineapple (primarily exported to Europe), and animal feed processing. Some part of the Central region has tannery, motor vehicle assemblies, cigarette manufacturing, textile (cotton), and wheat, bakeries, macadamia nuts, packaging, and industrial chemicals.

Thika sub county is located in Kiambu county within the Central region; the hospital has a bed capacity of 265 catering to almost one million patients annually. Thika is an industrial town that lies on the A2 road 40 km (25 miles) northeast of Nairobi, latitude and longitude 1.0500° S, 37.0833° E and an altitude of 1528 meters. The main economic activity includes agricultural processing, particularly in cooking oils (to the rest of Kenya

and Eastern Africa), coffee (exports mainly to the United States and Europe), horticulture and pineapple (exported mostly to Europe), and animal feed processing. Other industries include tannery, motor vehicle assemblies, cigarette manufacturing, textile (cotton), and wheat, bakeries, macadamia nuts, packaging, and industrial chemicals. Mbagathi Sub County hospital is in Nairobi City County, Mbagathi is one of Nairobi's high-volume hospitals, located on the edge of Kibera, Africa's largest slum. The hospital offers integrated health services. It is located in the Golf course location of Kibra constituency with a 200-bed capacity. The Hospital has the vision to be an autonomous, efficient facility where all receive comprehensive essential health care.

3.5 Study Population

The study population in this study were health records and information officers, administrators, doctors, nurses, and other staff working directly with EMR, e.g., pharmacy, laboratory, etc. in the selected hospitals.

3.6 Inclusion and Exclusion Criteria

3.6.1 Inclusion Criteria

The inclusion criteria in the study were the health care workers working with EMR for more than six months. Health workers working in hospitals rendering service on any other interoperable system at the time of the data collection period were included in the study.

3.6.2 Exclusion Criteria

The exclusion criteria in the study were healthcare providers who did not give consent, healthcare workers on emergencies cases, on leave, on internship and the new employees in the selected healthcare facilities.

3.7 Sampling Procedure

Simple random sampling was used to select 3 counties in Kenya with Nairobi, Kiambu and Nyeri County selected. Thereafter cluster sampling was used to select on public health facility in each county with Mbagathi, Nyeri, and Thika hospitals selected. Proportionate sampling methods were done to get the required sample sizes of the staff cadre. According to available data, the three hospitals have a total of 833 administrators, doctors, nurses, and ICT staff

(A. Taddese, 2017). Key Health Records and Information staff and management were chosen purposively to answer the KII.

Table 3. 1: Total number of Health Care Workers in Nyeri, Thika and Mbagathi hospitals

Target Groups	Nyeri C.H	Thika Level 5	Mbagathi C.H	Total
Doctors	48	38	46	**132**
Nurses	188	168	162	**518**
HRIT Officers	25	24	29	**78**
Others (Lab, Pharm, admin)	33	35	33	**37**
Total	**293**	**263**	**274**	**833**

3.8 Sample Size Determination

The study used the Yamane (1967) formula for sample size calculation. The Yamane formula for sample size calculation states that:

$$ny = \frac{N}{1 + Ne^2}$$

Yamane (1967)

Where;

Ny is Yamane sample size,

N is underlying population size and

e is determined from the confidence from your study. That is, *e*=0.05 at 95%.

$$ny = \frac{833}{1 + 833(⟦0.05)⟧^2}$$

Therefore, the sample size was 271

Ten percent (10%) of 271 was added. Therefore, a minimum of 299 respondents was used to cater for lost questionnaires, incomplete questionnaire and non-response or those not filled due to unknown reasons. The sample size was distributed among the three health facilities using the proportionate method.

Table 3.2: Proportionate Sampling total number of Health Care Workers in Nyeri, Thika and Mbagathi hospitals

Healthcare Facility	**Number**	**Percentage**
Nyeri	106	35.40
Thika	94	31.60
Mbagathi	99	33.00
Total	**299**	**100**.0

3.9 Research Instruments

3.9.1 The Questionnaire

Primary data was collected using a structured questionnaire, as shown in appendix 2. The use of questionnaire reduced the time burden on the researcher and the participants and enabled collection of data from the large sample size. The survey covered the socio-demographic information of the health workers, the level of technology use, individual characteristics, organizational factors, and technological factors. The knowledge was measured using a Likert scale ranging from 1 to 10, whereby every response had an individual score. The questionnaires were drafted in English language and administered to the various health workers as selected in the facilities.

3.9.2 Key Informant Interviews

Several KIIs interviews were conducted by a trained research assistant to various selected key informers such as the medical superintendent, head of the departments, and personnel in charge of EMR in the healthcare facilities. The KII enabled data collection from personnel who had firsthand information on diffusion of EMR in the facilities. The study used fifteen (15) KIIs in total; 5 in each facility.

3.10 Study Procedure

3.10.1 Pre-Testing of Data Collection Tools

Pre-testing was carried out at Murang'a County Referral Hospital. The pre-tests comprised 10% of the sample size, and the respondents were not included in the study. The questionnaire was reviewed based on pretest and ensured that it was appropriate for the task.

3.11 Validity and Reliability of the Research Instrument

3.11.1 Validity

The validity of the questionnaire was done to check whether the questions were constructed in a way that the responses would help answer the research questions. A pilot study done on the questionnaire realized that the questionnaire was able to answer the research questions thus it was considered valid.

3.11.2 Reliability

Cronbach's Alpha reliability coefficient was obtained for all the variables in the study. Cronbach's alpha coefficient is like probability and, therefore, ranges between zero and one. A coefficient of zero implied that the instrument had no internal consistency while that of one implied a complete internal consistency. Validity and reliability of this study were enhanced by translating the questionnaire and responses. The inclusion of participants working in a health facility for more than six months; this was to ensure that the recruited participants had relevant insight on EMR and understood the system. The research assistants were trained in data collection. The training included the study procedures such as identification of study participants, application of inclusion and exclusion criteria, administration of consent form, and extraction of variables of interest from the participants.

The Cronbach Alpha Reliability Coefficient test revealed that reliability results for the questionnaire as an instrument for socio-demographic characteristics was 0.750; for level of technology use was 0.792; for individual characteristics affecting the diffusion of

EMR it was 0.763; for organizational factors was 0.799 and for the technological factors influencing the diffusion of EMR it was 0.771.

Table 3. 3: Cronbach Alpha Reliability Coefficient for the questionnaire

Variables	Cronbach Alpha Coefficient
Socio-demographic characteristics	0.750
Level of technology use	0.792
Individual characteristics affecting the diffusion	0.763
Organizational factors influencing EMR diffusion	0.799
Technological factors influencing the diffusion of EMR	0.771

3.12 Data Collection Techniques

3.12.1 Participants' Recruitment and Data Collection

Healthcare workers were selected using proportionate sampling from the respective health facility in order to participate in this study. Required information that related to the study was provided, such as informed consent, objectives, accompanied by a structured, pre-tested administered questionnaire to collect data. The questionnaire comprised close-ended and multiple-choice questions. All participants were given a number that was used for coding questionnaires and to ensure that a respondent was not selected twice. The code in both informed consent form and questionnaire was crosschecked, and participant's responses were reviewed and verified on completion.

3.12.2 Data Management

The data was entered and kept in a research workbook, computer Microsoft Word, and Excel software.

3.13 Data Analysis

Data was then keyed in using SPSS version 26.0 with appropriate codes and variable specifications and counter-checked for possible erroneous entries. Data was then analysed based on the themes of research objectives. The significance level was set at probability $p< 0.05$ for every statistical set and 95% confidence interval.

3.14 Ethical Consideration

Study approvals were obtained from graduate school Ref No. Q141/CE/26174/2014, ethical approval from Kenyatta University Ethical Review Committee (KUERC) Ref No. KU/ERC/APPROVAL/VOL 1(249) and a research permit from the National Committee of Science, Technology, and Innovation (NACOSTI) Ref No. NACOSTI/P/19/43571/31064. Additionally, research authorization was also obtained from the relevant authorities at Nyeri, Thika, and Mbagathi Hospitals as well as informed consent from the respondents. The participants were informed that they had a right to participate or not participate in the study since it was voluntary. Confidentiality and anonymity were maintained at all times by ensuring that the respondents' details were not captured. There were no invasive procedures carried out on the participants, so no physical risks were encountered. Result of the study was communicated to Kenyatta University and the three Hospitals.

CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter presents results on socio-demographic information of the respondents, diffusion of electronic medical records, level of technology use in the hospitals, individual factors, organizational factors, and technological factors influencing diffusion of EMR. The study administered 299 questionnaires which were enumerated in tandem to the calculated sample size, of which 14 questionnaires were incompletely filled, therefore the response rate was 95.3% of the required sample size hence 285 questionnaires.

4.2 Demographics Characteristics of the Respondents

4.2.1 Socio- Demographics Characteristics of the Respondents

The respondents were required to indicate their age in respective categories which ranged from 23-56 years. A majority of the respondents ranged between 31 to 35 years at 103 (36.1%) while the least age category was 20-25 years at 24 (8.4%). On the marital status of the respondents, a majority indicated that they were single at 140 (49.1%) while a minority at 1 (0.4%) reported that they were widowed. The study participants were required to indicate their religious affiliations. A majority of the respondents at 176 (61.8%) suggested that they were Christians while 88 (30.9%) were Muslims. The data is as summarized in table 4.1.

Table 4.1: Socio-demographics of the Respondents

Characteristics		Frequency	Percentage
Age	20-25 years	24	8.4
	26-30 years	48	16.8
	31-35 years	103	36.1
	36-40 years	79	27.7
	41 and above	31	10.9
Gender	Male	136	47.7
	Female	149	52.3
Marital Status	Single	140	49.1
	Married	131	46.0
	Separated	10	3.5
	Divorced	3	1.1
	Widowed	1	0.4
Religion	Christian	176	61.8
	Muslim	88	30.9
	Traditional beliefs	21	7.4

4.2.2 Professional Characteristics

The majority 95 (33.3%) were nurses while the least were information and technology experts at 9 (3.2%). There was also a significant number of clinical officers at 71 (24.9%). The sampled healthcare workers had varied qualifications. A majority of the respondents were diploma holders at 128 (44.9%) while a minority were certificate holders at 18 (6.40%). The respondents had worked in the hospital over a varied duration of time. A majority at 115 (40.4%) had worked in the respective health facilities for a period of more than 8 years. On the other hand, the least number 21 (7.4%) of healthcare workers had worked in the respective hospitals for a duration of less than 3 years. The

respondents were required to capture their professional experience. A high number 126 (44.2%) of the healthcare workers had a work experience ranging of more than 10 years while the least number 12 (4.2%) indicated that they had a work experience of less than 3 years.

Table 4.2: Profession, Qualifications, and Experience of the Respondents

Professional characteristics		**Frequency**	**Percentage**
Cadre	Doctor	33	11.6
	Clinical officer	71	24.9
	Nurse	95	33.3
	Administration staff	13	4.6
	Health records	16	5.6
	Laboratory	20	7.0
	Physiotheraphy	10	3.5
	Pharmacy	18	6.3
	Information Technology	9	3.2
Level of Education	Postgraduate	19	6.7
	Degree	120	42.1
	Diploma	128	44.9
	Certificate	18	6.3
Years of working	Less than 3 years	21	7.4
	3-5 years	56	19.6
	6-8 years	93	32.6
	More than 8 years	115	40.4
Experience	Less than 3 years	12	4.2
	3-5 years	27	9.5
	5-8 years	56	19.6
	8-10 years	64	22.5
	More than 10 years	126	44.2

4.3 Diffusion of Electronic Medical Record

4.3.1 Degree of Electronic Medical Records System Diffusion

The respondents were asked whether the EMR system was diffused between various departments. A majority at 160 (56.1%) indicated that the system was partially electronic and partially paper between different departments. Further, 49 (17.2%) of the respondents reported that the system as not diffused between various departments.

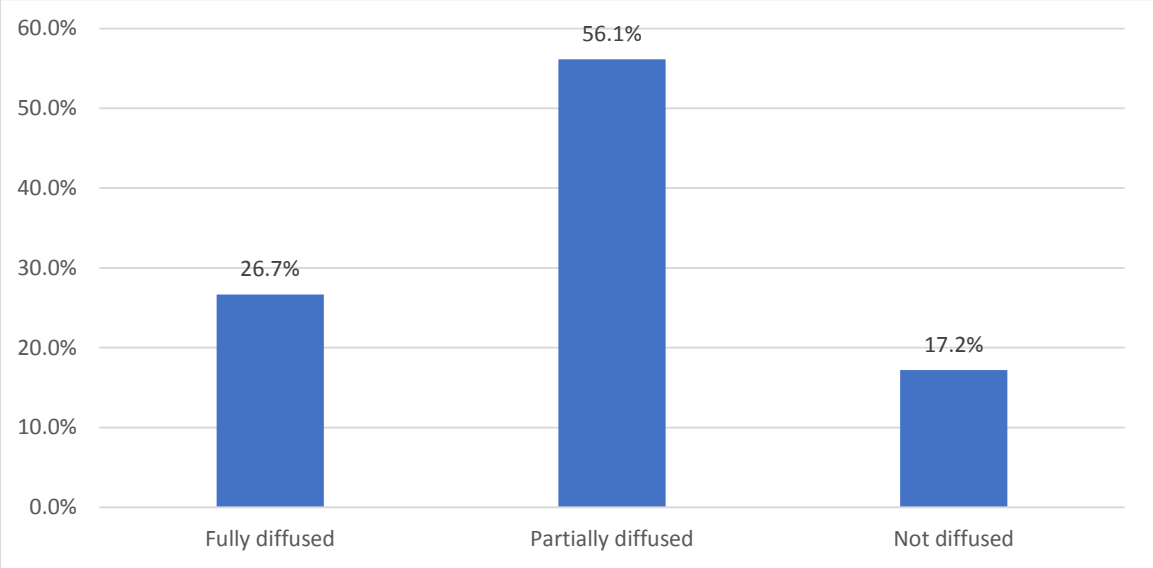


Figure 4.1: Degree of Electronic Medical Record System Diffusion

Some facilities have done assessment about the diffusion of EMR

…….. *Yes, sometimes we check on the usage of the system within the departments. However, the checks are performed once in a while"* (KII 2).

4.3.2 Extent of Various outpatient Services in Using Electronic Medical Records

On scheduling of appointments of clinics, the respondents, had a different extent of EMR usage (M=2.5035; SD=1.29554). The standard deviation is more than one, which means that the extent of the use of EMR in scheduling appointments of clinics varies from one healthcare facility to the other. The respondents also indicated different extent on the use

of EMR on writing pharmacy prescriptions 183(64.2%), electronic laboratory report 158(55.4%), recording consultations 172(60.4%), writing of patient summaries 180(63.2%), decision support system 192(67.3%), patient financial report 177(62.1%), making insurance claims 82(28.8%), staff payroll 78(27.4%), and recording consultations 82(28.8%) were partially diffused. However, the extent of using EMR on registration of patients, storage of patient information, and billings and payments were great. The mean and standard deviation of the listed services was (M=1.4912; SD=0.81194), (M=1.8702; SD=1.01779), and (M=1.8982; SD=1.58564) respectively. The standard deviation of registration of patients was less than one meaning that there was no variation on the extent of the use of EMR in the registration of patients in the three health facilities. On the other hand, the standard deviation of storage of patient information and billing and payment was higher than one indicating that there was a variation on the extent in which the hospitals use EMR to undertake these two services. The results are presented in table 4.3.

Table 4.3: Extent of Various outpatient services in Using Electronic Medical Records

Services conducted using EMR	Fully diffused	Partially diffused	Not diffused
Scheduling of appointments of clinics	42(14.8%)	158(55.4%)	85(29.8%)
Writing pharmacy prescriptions	32(11.2%)	183(64.2%)	70(24.6%)
Electronic Laboratory report	12(4.2%)	158(55.4%)	115(40.4%)
Registration of patients	16(5.6%)	186(65.3%)	83(29.1%)
Storage of patients' information	27(9.5%)	201(70.5%)	57(20.0%)
Recording consultations	14(4.9%)	172(60.4%)	99(34.7%)
Writing of patient summaries	13(4.6%)	180(63.2%)	92(32.3%)
Decision support system	19(6.7%)	192(67.3%)	74(26.0%)
Patient Financial data report	6(2.1%)	177(62.1%)	102(35.8%)
Billings and payments	10(3.5%)	143(50.2%)	132(46.3%)
Making insurance claims	25(8.8%)	82(28.8%)	178(62.5%)
Staff payroll	22(7.7%)	78(27.4%)	185(64.9%)
Recording consultations	12(4.2%)	82(28.8%)	191(67.0%)

One informant said there are effects of EMR on service delivery

"…….I think EMR has changed the time that is taken in service delivery. It also makes documentation and record keeping easy. It also takes care of the storage. The access to medical records through EMR is easier as compared to paper records" (KII 4).

4.4.3 Socio-Demographic Factors Influencing Diffusion of Electronic Medical Records

Further analysis with an aid of chi-square test was carried out in order to establish association between individual characteristics affecting the diffusion of EMR. The Pearson chi-square in Table 4.4 shows a statistically significant association between working experience (χ^2=15.301; df 6; p=0.018) with diffusion of EMR. Age (χ^2=3.784; df 4; p=0.876), gender of the health worker (χ^2=0.761; df 4; p=0.684), cadre (χ^2=1.378;

df 4; p=0.502), highest level of education (χ^2=2.215; df 6; p=0.301), and duration at the facility (χ^2=3.258; df 6; p=0.509) had no statistical relationship with diffusion of EMR, p>0.05 (Table 4.4).

Table 4.4: Socio-Demographic Factors Influencing Diffusion of Electronic Medical Records

Variables		Fully diffused	Partially diffused	Not diffused	Statistics
Age	20-25 years	5(20.8%)	13(54.2%)	6(25.0%)	χ^2=3.784 df 8 p=0.876
	26-30 years	13(27.1%)	25(52.1%)	10(20.8%)	
	31-35 years	27(26.2%)	57(55.3%)	19(18.4%)	
	36-40 years	22(27.8%)	48(60.8%)	9(11.4%)	
	41 years and above	9(29.0%)	17(54.8%)	5(16.1%)	
Gender	Male	34(25%)	80(58.8%)	22(16.2%)	χ^2=0.761 df 4 p=0.684
	Female	42(28.2%)	80(53.7%)	27(18.1%)	
Cadre	Clinician	64(25.9%)	142(57.5%)	41(16.6%)	χ^2=1.378 df 4 p=0.502
	Non-clinician	12(31.6%)	18(47.4%)	8(21.1%)	
Highest education	Postgraduate	5(26.3%)	9(47.4%)	5(26.3%)	χ^2=2.215 df 6 p=0.301
	Degree	39(30.5%)	66(51.6%)	23(18%)	
	Diploma	27(22.5%)	77(64.2%)	16(13.3%)	
	Certificate	5(27.8%)	8(44.4%)	5(27.8%)	
Working experience	Less than 3 years	5(23.8%)	8(38.1%)	8(38.1%)	**χ^2=15.301 df 6 p=0.018**
	3-5 years	23(41.1%)	25(44.6%)	8(14.3%)	
	6-8 years	23(24.7%)	54(58.1%)	16(17.2%)	
	More than 8 years	25(21.7%)	73(63.5%)	17(14.8%)	
Duration at facility	Less than 5 years	12(30.8%)	21(53.8%)	6(15.4%)	χ^2=3.258 df 6 p=0.509
	5-8 years	13(23.2%)	32(57.1%)	11(19.6%)	
	8-10 years	16(25.0%)	40(62.5%)	8(12.5%)	
	More than 10 years	35(27.8%)	67(53.2%)	24(19.0%)	

4.4 Individual Characteristics Affecting the Diffusion of Electronic Medical Records

4.4.1 Lack of Training and Leadership Affecting Diffusion

Table 4.5 shows that lack of training (χ^2=10.919; df 8; p=0.031), lack of effective leadership (χ^2=8.062; df 8; p=0.041), and adequacy of technical skills on IT systems (χ^2=11.508; df 8; p=0.025) affect the diffusion of EMR.

Table 4.5: Lack of Training and Leadership Affecting Diffusion of Electronic Medical Records

Variables		Fully diffused	Partially diffused	Not diffused	Statistics
Lack of training affect the use of EMR	Very great degree	22(31.9%)	39(56.5%)	8(11.6%)	χ^2**=10.919 df 8 p=0.031**
	Great extent	11(19.3%)	35(61.4%)	11(19.3%)	
	Moderate extent	17(29.3%)	28(48.3%)	13(22.4%)	
	Less extent	13(23.2%)	34(60.7%)	9(16.1%)	
	Not at all	13(28.9%)	24(53.3%)	8(17.8%)	
Lack of effective leadership affects the use of EMR	Very great degree	11(19.3%)	35(61.4%)	11(19.3%)	χ^2**=8.062 df 8 p=0.041**
	Great extent	15(29.4%)	28(54.9%)	8(15.7%)	
	Moderate extent	18(29%)	35(56.5%)	9(14.5%)	
	Less extent	15(25.0%)	33(55.0%)	12(20.0%)	
	Not at all	17(30.9%)	29(52.7%)	9(16.4%)	
Adequacy of technical skills on IT systems within the hospital	Very high	10(19.2%)	32(61.5%)	10(19.2%)	χ^2**=11.508 df 8 p=0.025**
	High	21(33.9%)	34(54.8%)	7(11.3%)	
	Average	16(31.4%)	25(49.0%)	10(19.6%)	
	Low	16(24.6%)	40(61.5%)	9(13.8%)	
	Very low	13(23.6%)	29(52.7%)	13(23.6%)	

4.4.2 Level of Computer Literacy

The level of computer literacy among the respondents affected the diffusion of EMR (χ^2=6.562; df 8; p=0.044) as indicated in table 4.6.

Table 4.6: Level of Computer Literacy

Variables		Fully diffused	Partially diffused	Not diffused	Statistics
Levels of computer literacy	Very high	17(28.3%)	34(56.7%)	9(15%)	χ^2**=6.562 df 8 p=0.044**
	High	16(31.4%)	28(54.9%)	7(13.7%)	
	Average	13(25.5%)	30(58.8%)	8(15.7%)	
	Low	9(15.5%)	36(62.1%)	13(22.4%)	
	Very low	21(32.3%)	32(49.2%)	12(18.5%)	

During interview, one of the respondents pointed out that:

".... being a doctor, we are not trained on data issues in medical schools therefore not very good and again when appointed in offices with new mandates and roles there are no induction… we learn issues of data in the hard way either during meeting or when asked by county offices'' (KII, 3).

4.5 The Level of Technology Use

4.5.1 Level of Knowledge on Computer Application in Clinical Practice

The respondents were asked to rank their level of knowledge on computer applications in clinical practice. A majority at 140 (49.1%) reported that their experience on the use of computer applications in clinical practice was moderate. A significant number 11 (3.9%) of the respondents indicated that their knowledge was low.

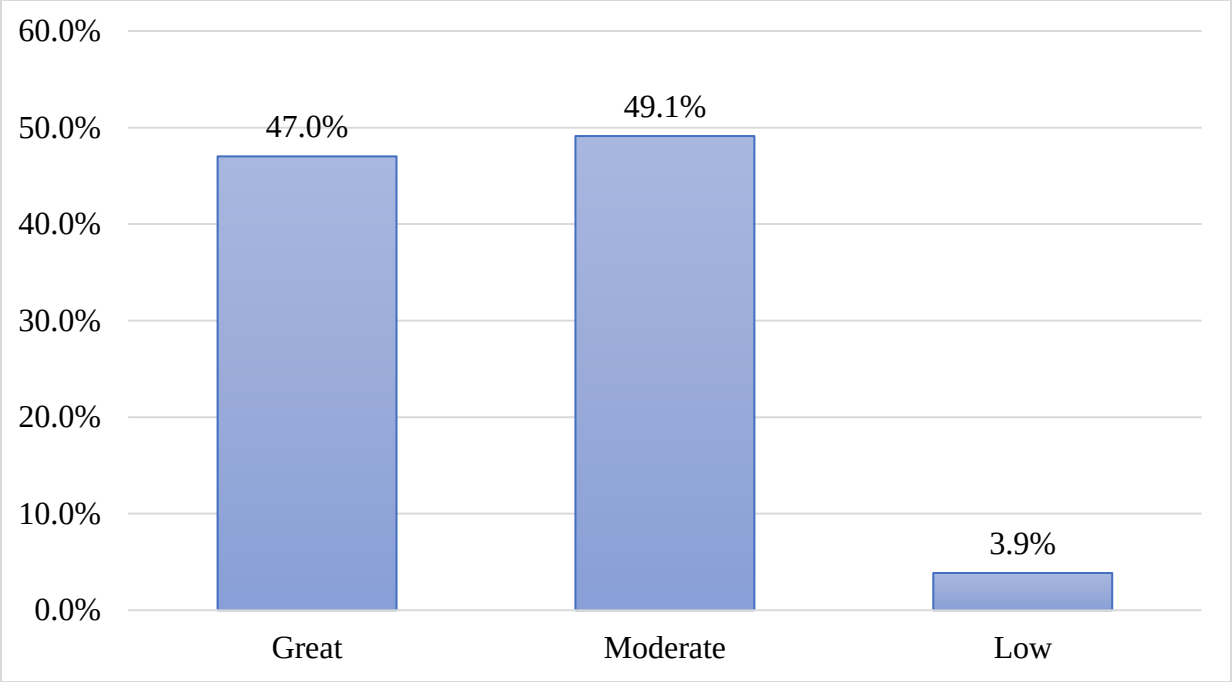


Figure 4.2: Level of Knowledge on Computer Application in Clinical Practice

4.5.2 Use of Electronic Medical Records

The study participants were required to answer whether they were using EMR during the period of the study. A majority at 250 (88%) reported that they were using the application while a minority at 35 (12%) indicated that they did not utilize the application in their work operations.

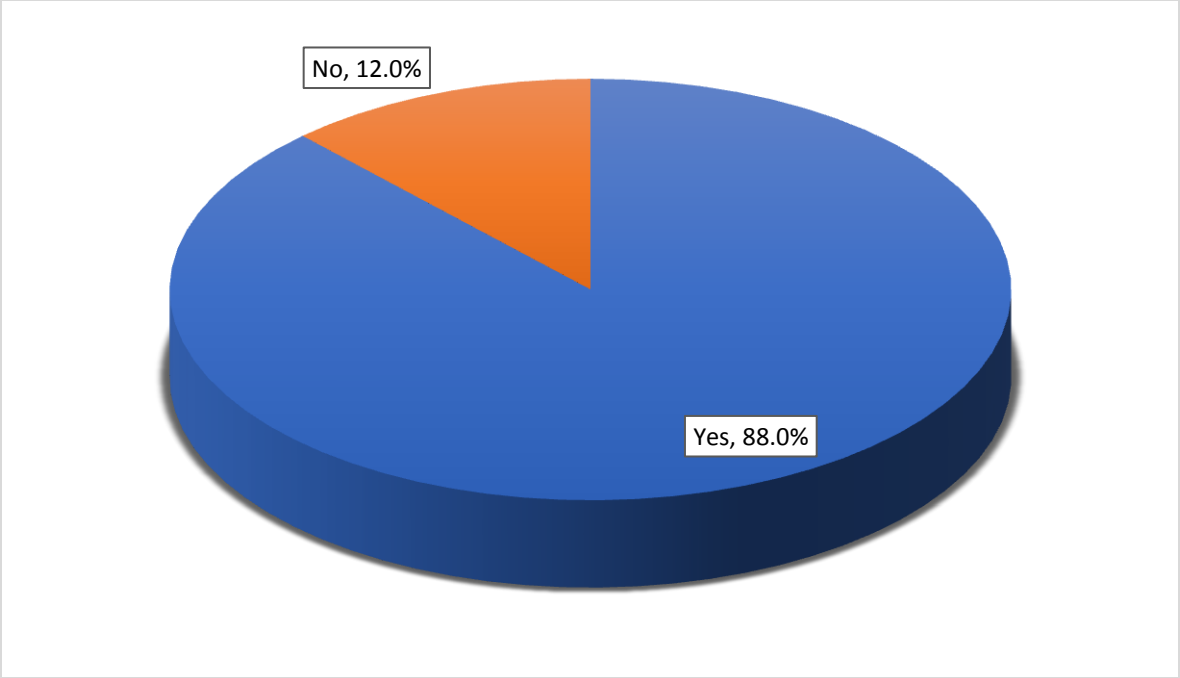


Figure 4.3: Respondent use of Electronic Medical Records

During the qualitative interview respondents said the departments are linked to EMT

"We have about 12 departments which are connected. All the major departments and wards have EMR systems" (KII 2).

4.5.3 Voluntary Use of Electronic Medical Records

A follow-up question on the usage of EMR indicated that among all the healthcare providers who use the application, a majority 189 (76.2%) do so voluntarily. However, 59 (23.8%) reported that they are compelled by the hospital management to use the system.

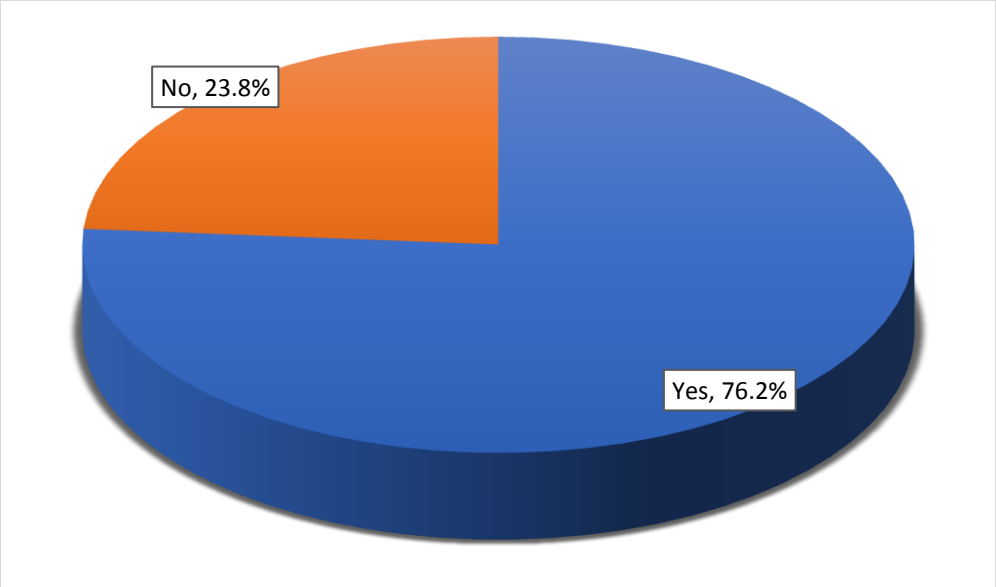


Figure 4.4: Voluntary use of Electronic Medical Records

However, some informants disclosed that there is low diffusion of EMR in the facility

"I would think that the uptake of the EMR is not very good in all the departments. There is a significant number of departments which still use the old ways of documentation and records. For the confidentiality and privacy, the EMR is safe since it is protected under passwords and it is only accessible to the authorized people only" (KII, 1).

"I think full adoption of EMR the way to go. Therefore, there should be full support by the government and donor agencies to ensure that the adoption is full. There should also be training and refresher courses to the staff to ensure that they are competent enough to use EMR" (KII 5).

4.5.4 Reasons for not Voluntarily Using Electronic Medical Records

The respondents who reported that they were instead compelled to use EMR rather than using it voluntarily gave various reasons. A majority of 20 (58%) said that the application

was time-consuming while minority 14 (42%) indicated that the system was most not functional, thus slowing down their work.

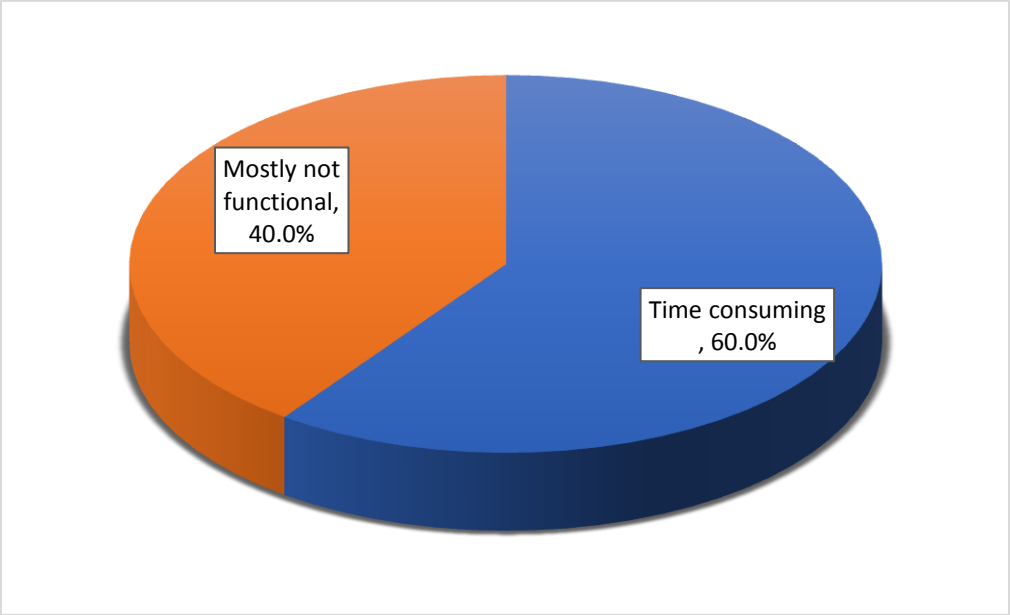


Figure 4.5: Reasons for not Using Electronic Medical Records

However, ICT staff within the facility said they train all staff on the use of EMR

"We support them through training the other support is when they have a challenge, we have numbers that they can call to the ICT department. we also advise the departments when they are having a meeting in case, they have an issue with EMR they should make sure that it has been passed to the ICT people" (KII 2).

"As the ICT department, we are in charge of the system. We support various departments through training, refreshers, and any emergency support" (KII 1).

4.5.5 Electronic Medical Records Network to Other Departments

The respondents were required to give information on whether EMR in their place of work was linked to other departments. A majority of 242 (90%) of the respondents reported that it was connected. However, 27 (10%) of the study participants reported that their areas of work had EMR but not attached to other departments.

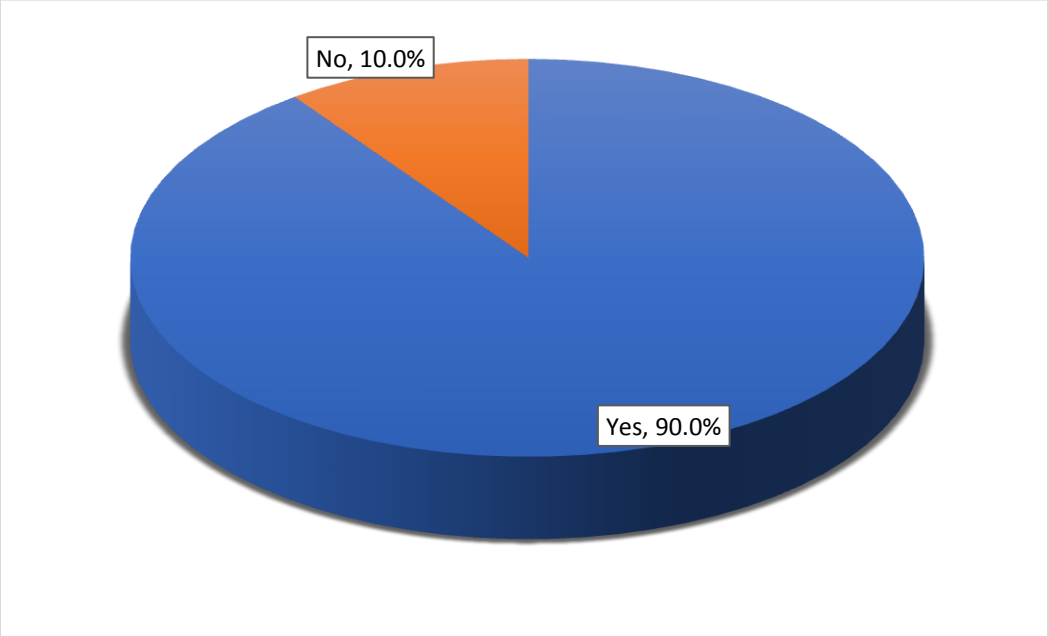


Figure 4.6: Electronic Medical Records Network Connection to Other Departments

There are departments in this facility that are connected to EMR department as one informant narrated.

"In this facility the Lab, Records, Dental, Physio, Filter clinics, Consultant Clinic, OCC, CCC, OT, Eye, ENT, stores, and 8 wards……. This makes a total of 20…are all linked to EMR" (KII 4).

"Yes. But all the departments have the personnel in charge such as the managers who give various directives on the operations in the units. But I should say that the ICT is

responsible for EMR and its use. We also train new employee and perform refresher courses" (KII 1).

4.5.6 Respondents' Level of Understanding of Working with Electronic Medical Records System

The study participants were required to indicate their level of understanding working with the EMR system. A majority of 136 (47.7%) reported that their level of knowledge and working with the system was high. Although the responses show varied responses, it is essential to note that a significant number 16 (5.6%) and 3 (1.1%) of the respondents reported that their understanding of working with EMR system was low and very low respectively.

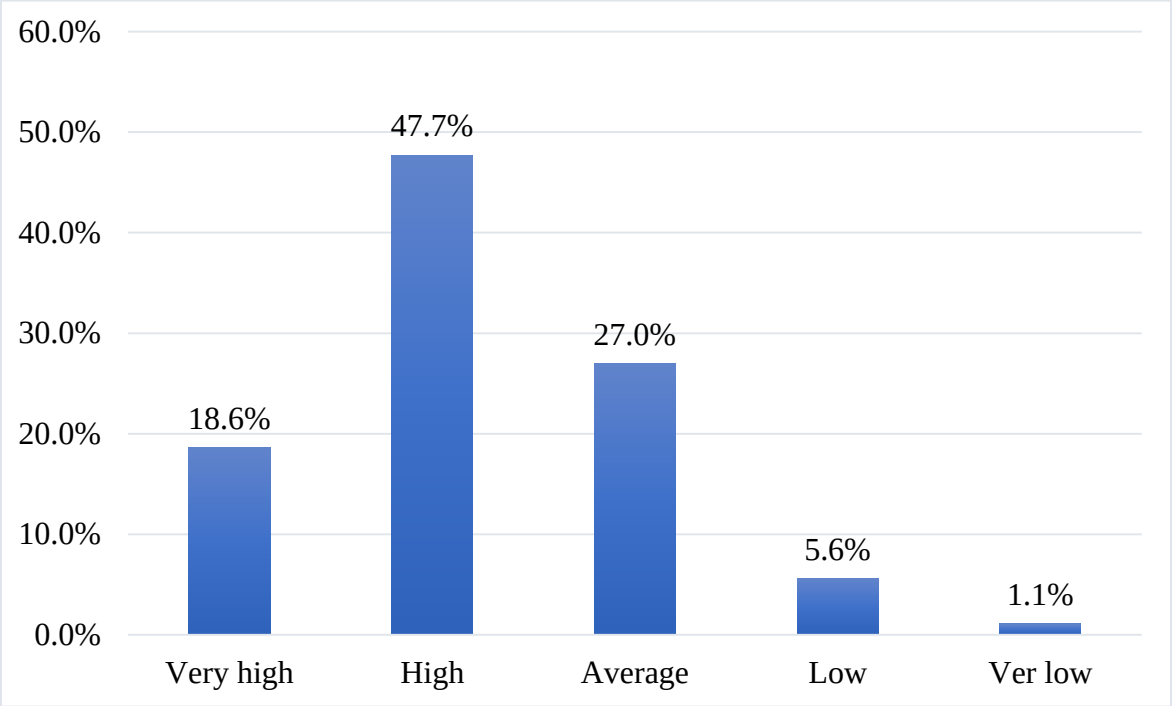


Figure 4.7: Respondents' Level of Understanding of Working with Electronic Medical Records System

Key informant interview narrated that they are able to understand and easily utilize the EMR system

"……..Yes, I can say somehow because we have the ICT that is supposed to look to all issues pertaining to ICT throughout the year, the system and all that, for example who needs what? The training? because we could have new employees who needs to be trained and also when we feel we need a refresher training" (KII 3).

4.5.7 Responsibility for Assigning Electronic Medical Records Security Privileges to Staff

The respondents indicated that various people were in charge of assigning their security privileges for access and the use of EMR. A majority of 160 (56.3%) indicated that the office managers were in charge while 15 (5.3%) reported that the physicians were in control. A significant number 67 (23.6%) also reported that the IT personnel were in charge of giving EMR access and security privileges to the staff.

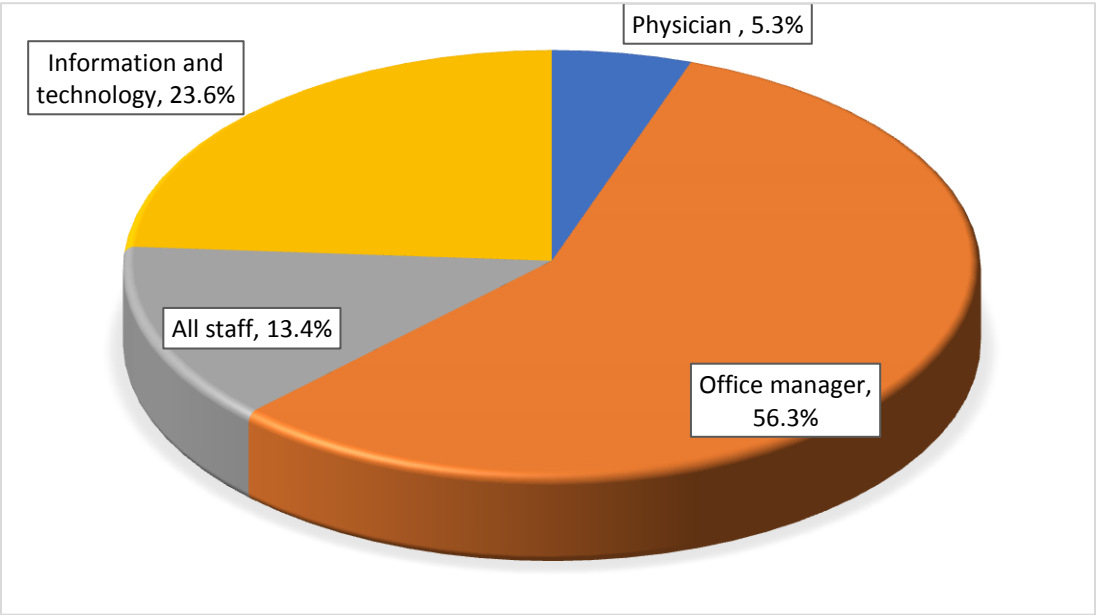


Figure 4.8: Person responsible for assigning Electronic Medical Records Security Privileges to Staff

4.5.8 Model Coefficients on Technology Use

Indicatively, the technology use affecting diffusion of EMR can be determined (predicted) using key risk factors which are namely; understanding of working with EMR system (p=0.0001), and assigning EMR security privileges to staff (p=0.046) as shown in Table 4.7.

Table 4.7: How Different technological Factors Influence diffusion of Electronic Medical Records

	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	0.631	0.214		2.956	0.003
Knowledge on computer application	0.069	0.060	0.059	1.147	0.252
Uses EMR	0.200	0.104	0.099	1.910	0.057
EMR Network to Other Departments	0.221	0.113	0.102	1.957	0.051
Understanding of working with EMR system	0.499	0.081	0.647	6.157	**0.000**
Assigning EMR security privileges to staff	-0.184	0.092	-0.211	-2.002	**0.046**

a. Dependent Variable: Degree of EMR System Diffusion

4.5.9 Relationship Between Technology Use and Diffusion of Electronic Medical Records

Pearson correlation coefficient (r) analysis was used to determine the correlation between the variables of interest in this study. The results of Table 4.8 demonstrate the significance of the association between degree of EMR system diffusion, EMR network, knowledge on computer application, uses EMR, understanding of working with EMR system and assigning EMR security privileges to staff. The findings indicated that while there is no statistically significant association between degree of EMR system diffusion with knowledge on computer application (r = 0.107, p =0.071), and uses EMR (r = 0.103,

p= 0.083). However, there was a statistically significant and stronger positive relationship between degree of EMR system diffusion with EMR network (r= 0.119, p=0.044), understanding of working with EMR system (r= 0.479, p=0.000), and assigning EMR security privileges to staff (r= 0.372, p=0.000). The predictor factor demonstrated a positive connection with the response variable, suggesting that may be used to describe the diffusion of EMR.

Table 4.8: Relationship Between Technology Use and Diffusion of Electronic Medical Records

		1	2	3	4	5	6
Degree of EMR System Diffusion	r	1	0.107	0.103	0.119*	0.479**	0.372**
	Sig.		0.071	0.083	0.044	0.000	0.000
	N	285	285	285	285	285	285
Knowledge on computer application	r	0.107	1	0.013	-0.01	0.095	0.066
	Sig.	0.071		0.829	0.868	0.11	0.264
	N	285	285	285	285	285	285
Uses EMR	r	0.103	0.013	1	-0.052	0.029	0.047
	Sig.	0.083	0.829		0.379	0.631	0.431
	N	285	285	285	285	285	285
EMR Network to Other Departments	r	0.119*	-0.01	-0.052	1	0.073	0.114
	Sig.	**0.044**	0.868	0.379		0.216	0.054
	N	285	285	285	285	285	285
Understanding of working with EMR system	r	0.479**	0.095	0.029	0.073	1	0.870**
	Sig.	**0.000**	0.11	0.631	0.216		0.000
	N	285	285	285	285	285	285
Assigning EMR security privileges to staff	r	0.372**	0.066	0.047	0.114	0.870**	1
	Sig.	**0.000**	0.264	0.431	0.054	**0.000**	
	N	285	285	285	285	285	285

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

4.6 Organizational Factors Influencing Electronic Medical Records Diffusion

The organizational factors were analysed to determine influence of diffusion of EMR. The findings revealed that lack of adequate infrastructure affects the EMR sustainability (χ^2=7.879; df 4; p=0.046), inadequate sources of funding inhibit EMR technology sustainability in our organisation (χ^2=9.186; df 4; p=0.017), lack of technical personnel to install and operate EMR technology resources is an impediment to its sustainability (χ^2=8.615; df 4; p=0.042), and the consistency rate of internet connection (bandwidth) at your hospital inhibit EMR technology sustainability (χ^2=14.882; df 4; p=0.005) were factors affecting the diffusion of EMR (Table 4.9). Further analysis found that cost of EMR resources and facilities purchase is the greatest barrier to its adoption and sustainability (χ^2=1.575; df 4; p=0.813), mmaintenance costs of EMR technology facilities hinder its sustainability and utilisation in our institution (χ^2=1.895; df 4; p=0.755), level of understanding on working under EMR system is affecting EMR diffusion and its sustainability (χ^2=2.910; df 4; p=0.573), and lack of policies and guidelines affect the diffusion of EMR (χ^2=2.324; df 4; p=0.676) were not affecting the diffusion of EMR (Table 4.9).

Table 4.9: Organizational Factors Influencing Electronic Medical Records Diffusion

Variables		Fully diffused	Partially diffused	Not diffused	Statistics
Lack of adequate infrastructure affects the use of EMR	Agree	22(18.3%)	74(61.7%)	24(20.0%)	**χ^2=7.879 df 4 p=0.046**
	Uncertain	18(30.0%)	33(55.0%)	9(15.0%)	
	Disagree	36(34.3%)	53(50.5%)	16(15.2%)	
Cost of EMR resources is a barrier to its adoption	Agree	29(26.1%)	61(55%)	21(18.9%)	χ^2=1.575 df 4 p=0.813
	Uncertain	21(31.3%)	35(52.2%)	11(16.4%)	
	Disagree	26(24.3%)	64(59.8%)	17(15.9%)	
Lack of technical personnel for EMR affects its adoption	Agree	23(19.5%)	76(64.4%)	19(16.1%)	**χ^2=8.615 df 4 p=0.042**
	Uncertain	16(32.7%)	25(51.0%)	8(16.3%)	
	Disagree	37(31.4%)	59(50%)	22(18.6%)	
Maintenance costs of EMR affects its sustainability and use	Agree	32(25.6%)	69(55.2%)	24(19.2%)	χ^2=1.895 df 4 p=0.755
	Uncertain	16(28.6%)	29(51.8%)	11(19.6%)	
	Disagree	28(26.9%)	62(59.6%)	14(13.5%)	
Inadequate sources of funding inhibit EMR technology	Agree	29(27.9%)	61(58.7%)	14(13.5%)	**χ^2=9.186 df 4 p=0.017**
	Uncertain	11(17.7%)	33(53.2%)	18(29.0%)	
	Disagree	36(30.3%)	66(55.5%)	17(14.3%)	
The consistency rate of internet connection affects the diffusion of EMR	Agree	19(17.0%)	74(66.1%)	19(17.0%)	**χ^2=14.882 df 4 p=0.005**
	Uncertain	22(40.7%)	20(37.0%)	12(22.2%)	
	Disagree	35(29.4%)	66(55.5%)	18(15.1%)	
Level of understanding how EMR work affects its diffusion	Agree	30(26.8%)	64(57.1%)	18(16.1%)	χ^2=2.910 df 4 p=0.573
	Uncertain	13(19.7%)	41(62.1%)	12(18.2%)	
	Disagree	33(30.8%)	55(51.4%)	19(17.8%)	
Lack of EMR policies and guidelines affects its diffusion	Agree	21(22.6%)	56(60.2%)	16(17.2%)	χ^2=2.324 df 4 p=0.676
	Uncertain	19(25.3%)	44(58.7%)	12(16.0%)	
	Disagree	36(30.8%)	60(51.3%)	21(17.9%)	

4.7 Technological Factors Affecting the Diffusion of Electronic Medical Records

Diffusion of EMR was affected by technological factors, the chi-square analysis results in the Table 4.9 indicates that lack of training new hospital staff on EMR usage & operations (χ^2=8.170; df 2; p=0.019), lack of technical personnel to install and operate EMR technology resources is an impediment to its sustainability χ^2=10.071; df 2;

p=0.015), absence of computer skills amongst health care staff (χ^2=7.404; df 2; p=0.038), and inadequate internet bandwidth is a notable challenge to diffusion of EMR (χ^2=9.504; df 2; p=0.032) were affecting diffusion of EMR (Table 4.10).

Table 4.10: Technological Factors Affecting the Diffusion of Electronic Medical Records

Variables		Fully diffused	Partially diffused	Not diffused	Statistics
The fear of using technology is a barrier to the diffusion of EMR	Yes	36(25.4%)	77(54.2%)	29(20.4%)	χ^2=2.085
	No	40(28%)	83(58%)	20(14%)	df 2 p=0.353
Lack of training new hospital staff on EMR usage & operations	Yes	33(25.6%)	74(57.4%)	22(17.1%)	**χ^2=8.170**
	No	43(27.6%)	86(55.1%)	27(17.3%)	**df 2 p=0.019**
Lack of technical personnel is an impediment to its sustainability	Yes	42(26.6%)	88(55.7%)	28(17.7%)	**χ^2=10.071**
	No	34(26.8%)	72(56.7%)	21(16.5%)	**df 2 p=0.015**
Lack of time due to day-today work load	Yes	45(30.4%)	74(50%)	29(19.6%)	χ^2=4.714
	No	31(22.6%)	86(62.8%)	20(14.6%)	df 2 p=0.095
Absence of computer skills amongst health care staff	Yes	36(25.5%)	77(54.6%)	28(19.9%)	**χ^2=7.404**
	No	40(27.8%)	83(57.6%)	21(14.6%)	**df 2 p=0.038**
Legal concerns such as security and patient's privacy affect the diffusion of EMR	Yes	35(25%)	82(58.6%)	23(16.4%)	χ^2=0.670
	No	41(28.3%)	78(53.8%)	26(17.9%)	df 2 p=0.715
Inadequate data exchange between departments	Yes	42(28.2%)	82(55%)	25(16.8%)	χ^2=5.370
	No	34(25%)	78(57.4%)	24(17.6%)	df 2 p=0.051
Inadequate internet bandwidth is a notable challenge to diffusion of EMR	Yes	43(29.1%)	78(52.7%)	27(18.2%)	**χ^2=9.504**
	No	33(24.1%)	82(59.9%)	22(16.1%)	**df 2 p=0.032**
Poor communication between various players affects the diffusion of EMR	Yes	38(27.5%)	81(58.7%)	19(13.8%)	χ^2=2.212
	No	38(25.9%)	79(53.7%)	30(20.4%)	df 2 p=0.331

The KIIs respondents highlighted various opinions on the diffusion of EMR. An interviewee was quoted "The use of EMR technology has made work easier in various departments and also it has led to safe record keeping of the patients. It has also led to

easy follow up of patients' medical history. On the technological factors that affect the diffusion of EMR, another KII informant reported that

"The implementation of EMR is expensive to purchase and to maintain. These are some of the challenges that have led to EMR not being fully implemented. Also, most of the staff are elderly and not conversant with technology hence working towards diffusion of EMR is hard…. making them adopt technology requires a lot of training, which is expensive" (KII 3).

On a separate KII, it was noted that

"The EMR technology is to the healthcare providers' advantage since they can retrieve old patient information and sometimes it is time-saving because it a matter of click and the patient data is displayed on the computer screen." (KII 5).

4.8 Summary of the Findings

To answer various questions on the extent of EMR diffusion in Nyeri, Thika, and Mbagathi Hospitals, different respondents were engaged. The study respondents comprised pharmacists, doctors, clinical officers, nurses, administration staff, health records, laboratory technologists, and physiotherapists. Several factors were found to affect EMR diffusion. Work experience showed a significant association with EMR adoption, while demographic factors like age and gender did not. Organizational challenges included lack of training, effective leadership, and technical IT skills. Infrastructure inadequacies, funding limitations, and shortage of technical personnel were identified as major barriers. Technological factors, such as insufficient training for new staff and low computer literacy among healthcare workers, also impeded EMR diffusion.

Internet bandwidth issues were notably problematic for system sustainability. Despite these challenges, EMR systems demonstrated clear benefits, including improved service delivery time, enhanced documentation, and better record-keeping. They also increased patient data accessibility while maintaining confidentiality. However, high implementation and maintenance costs, coupled with resistance from older staff unfamiliar with technology, posed significant hurdles. To address these issues, the study recommends full government and donor support for complete EMR adoption, increased staff training and refresher courses, and targeted efforts to improve infrastructure and bandwidth. By addressing these barriers, healthcare facilities could significantly enhance EMR adoption and utilization, ultimately improving the quality and efficiency of healthcare delivery.

CHAPTER FIVE: DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This chapter contains a summary of the findings of the study, discussion, conclusions, and recommendations on the diffusion of EMR in Nyeri, Thika, and Mbagathi Hospitals.

5.2 Discussion of the Findings

5.2.1 Level of Technology Use in the Hospitals

The study found that the diffusion of EMR from the department was partial since most of the functions were partly electronic and partially paper. The use of the system in most of the operations was moderate. However, the use of EMR varied depending on the nature of services. The use of the system was high on registration of patients, storage of the patients' information, and billing and payments. Other functions such as scheduling of appointments of clinics, writing of pharmacy prescriptions, recording consultations, writing patient summaries, decision and support, and making insurance claims relied on the system on a moderate and low extent. The study findings are in line with Wilke *et al.*, (2019) who note that the diffusion of EMR in hospitals is improving. The study also concurs with Ochieng & Hosoi (2019), who articulate that the diffusion and the uptake of EMR in hospitals are high. The improvement of the EMR uptake and adoption can be attributed to the fact that more people are now embracing technology. The ICT is taking a centre-stage in most of the operations in both the private and public sector and, therefore, the hospitals have not been left behind.

5.2.2 Individual Factors Influencing the Diffusion of Electronic Medical Records

Although the diffusion of EMR was found to be moderate, various individual factors were found to influence the uptake and adoption of the system. Lack of training on the system was one of the predictors of the level of diffusion. Knowledge of EMR and application of computer knowledge in clinical practice were also found to influence the diffusion of EMR. The findings concur with Angst *et al.*, (2022) who articulate that individual factors play a significant role in the diffusion of EMR. The study found that computer knowledge among the staff was moderate. The average experience can act as a barrier towards diffusion of technology since adequate computer skills play a significant role in the diffusion and adoption of the system. The study also established that only half of the participants had a high knowledge of EMR. The findings are inconsistent with Miller & Tucker (2021), who found that slightly more than half of the sampled respondents were familiar with the operations of EMR. Understanding the system is a significant aspect of its diffusion. Therefore, the level of healthcare providers' understanding of the system plays an essential aspect of diffusion.

5.2.3 Organizational Factors Influencing the Diffusion of Electronic Medical Records

Various organizational factors were found to influence the diffusion of EMR. Lack of training was one of the organizational factors that influence the uptake and adoption of EMR with health facilities. The study also noted that the low understanding of how EMR works, cost of the systems and its related resources, and inadequate sources of funding were some of the significant factors that influence its adoption. The study findings are supported by Caine & Hanania (2019) who posited that despite the calls to adopt

technology in many government agencies, there is still a shortage of resources to train and support the infrastructure. Abimbola (2019) argues that despite the introduction of the EMR system, much of the operations remain with the vendors and the ICT experts. As a result, most of the users are not very familiar with the operation of the system and thus prefer using paper-based documentation and communication between departments. Akinyele *et al.,* (2019) note that resources are unique organizational factors which must be provided to support EMR as well as its maintenance. Adequate technical personnel were also found to be among the organizational factors that influence the diffusion of EMR. The findings were inconsistent with a study by Blaya *et al.,* (2022) who noted that the ICT experts were enough for the task and did not influence the diffusion of the technology. The inconsistency can be attributed by the fact the latter undertook their study in a developed country and, therefore, there was no shortage of human resources.

5.2.4 Technological Factors Influencing the Diffusion of Electronic Medical Records

The study established various technological factors about the diffusion of EMR. Some of the factors were the fear of using technology, lack of enough training among the EMR users and the staff, lack of technical personnel, high workload, and absence of computer skills. The study findings are in agreement with Ajami & Bagheri-Tadi (2020) who articulate that capacity building is needed for full diffusion of EMR. Akinyele *et al.,* (2019) noted that adequate computer knowledge should supplement the training on EMR to ensure that the staff are confident enough with the technology. The study also agrees with Akanbi *et al.,* (2019) who notes that lack of awareness on primary computer use was significantly associated with the level of diffusion of EMR. Staff must have a high

technological understanding of the operations of the EMR system to ensure that they can utilize it to the maximum. Al Aswad (2019) articulates that the people should be customized enough to enable them to adopt and use new technology. As a result, technology suppliers should be able to offer adequate training and support to EMR users.

5.3 Conclusion

The study found out that the level of understanding of the EMR was moderate among the respondents in the three sampled health facilities. However, the level of diffusion of EMR from one department to another was low since operations were partially electronic and partly paper. The understanding of the system was moderate, but there was still a significant number of respondents who reported low knowledge of the operations of EMR. The use of the system varied depending on the type of the function with registration of patients, storage of patients' information, and billing and payments reporting high usage. Working experience (p=0.018) was associated with diffusion of EMR.

The study revealed that some of the individual factors that influenced the use of EMR was lack of training (p=0.031), low computer skills (p=0.025), and inadequacy of skilled personnel (p=0.041). Additionally, understanding of working with EMR system (p=0.0001), and assigning EMR security privileges to staff affected diffusion of EMR (p=0.046).

The study also found out that the major organizational factors that affect diffusion are lack of adequate infrastructure (p=0.046), inadequate sources of funding in our organisation (p=0.017), lack of technical personnel to install (p=0.042), and operate EMR

technology resources (p=0.042), and the consistency rate of internet connection (bandwidth) (p=0.005).

The study found that lack of training new hospital staff on EMR usage & operations (p=0.019), lack of technical personnel to install and operate EMR technology resources is an impediment to its sustainability (p=0.015), absence of computer skills amongst health care staff (p=0.038), and inadequate internet bandwidth is a notable challenge to diffusion of EMR were technological factors affecting diffusion of EMR (p=0.032).

5.4 Recommendations

1. The hospital administration to develop continuous professional development programs for healthcare workers to improve their skills in using EMR systems effectively thus improve the level of diffusion.
2. The County Health Management Team (CHMT) and hospital administration to develop guideline to support healthcare workers on the need to utilize EMR, thus, more training should be undertaken to ensure that all the healthcare providers are fully equipped with needed knowledge on the use and operation of EMR
3. The government, the county government, donors, and other stakeholders should create awareness on the advantage of the electronic medical records and invest more on EMR to address the inadequacy of resources which was found to influence its adoption.
4. The county government should strengthen organizational resources that supports information use at all levels through provision of tools, computer, skilled personnel, automation, connectivity, complimented by targeted regular support supervision, review meetings and job descriptions outlining information roles and

responsibilities. The hospitals should invest more on the support to ensure that there are enough skilled personnel to ensure that the EMR system is fully functional.

5.5 Recommendations for Further Research

1. A comparative study can be conducted in private and public hospitals to compare the level of diffusion of EMR

REFERENCES

Abimbola, I. G. (2019). Assessing Value Added in the Use of Electronic Medical Records in Nigeria.

Agha, L. (2019). The effects of health information technology on the costs and quality of medical care. *Journal of health economics*, *34*, 19-30.

Ajami, S., & Bagheri-Tadi, T. (2020). Barriers for adopting electronic health records (EHRs) by physicians. *Acta Informatica Medica*, *21*(2), 129.

Akanbi, M. O., Ocheke, A. N., Agaba, P. A., Daniyam, C. A., Agaba, E. I., Okeke, E. N., & Ukoli, C. O. (2019). Use of electronic health records in sub-Saharan Africa: progress and challenges. *Journal of Medicine in the Tropics*, *14*(1), 1.

Akinyele, J. A., Pagano, M. W., Green, M. D., Lehmann, C. U., Peterson, Z. N., & Rubin, A. D. (2019). Securing electronic medical records using attribute-based encryption on mobile devices. In *Proceedings of the 1st ACM workshop on Security and privacy in smartphones and mobile devices* (pp. 75-86). ACM.

Al Aswad, A. M. (2019). *Issues Concerning the Adoption and Usage of Electronic Medical Records in Ministry of Health Hospitals in Saudi Arabia* (Doctoral dissertation, University of Sheffield).

Al-Rayes S.A., Alumran A. (2019) The adoption of Electronic Health Records by physician

Andrews, G., Goldberg, D. P., Krueger, R. F., Carpenter, W. T., Hyman, S. E., Sachdev, P., & Pine, D. S. (2021). Exploring the feasibility of a meta-structure for DSM-V

and ICD-11: could it improve utility and validity?: Paper 1 of 7 of the thematic section:'A proposal for a meta-structure for DSM-V and ICD-11'. *Psychological Medicine*, *39*(12), 1993-2000.

Angst, C. M., Agarwal, R., Sambamurthy, V., & Kelley, K. (2022). Social contagion and information technology diffusion: the adoption of electronic medical records in US hospitals. *Management Science*, *56*(8), 1219-1241.

Babbott, S., Manwell, L.B., Brown, R., Montague, E., Williams, E., Schwartz, M., Hess, E., & Linzer, M. (2020). Electronic medical records and physician stress in primary care: results from the MEMO Study. *Journal of the American Medical Informatics Association*, *21*(e1), pp.e100-e106.

Beacham, T. L. (2021). *Rural Physicians Perceptions of Implementationof Electronic Health Record (EHR) Systems* (Doctoral dissertation, The University of Mississippi Medical Center).

Beke, A, & Tilahun, B. (2019). Maturity and factors affecting the adoption of Electronic Medical Record; A systematic Review Journal of Biomedical informatics, 69, 1-28.

Blaya, J. A., Fraser, H. S., & Holt, B. (2022). E-health technologies show promise in developing countries. *Health Affairs*, *29*(2), 244-251.

Blumenthal, D., & Tavenner, M. (2022). The "meaningful use" regulation for electronic health records. *New England Journal of Medicine*, *363*(6), 501-504.

Boonstra, A., & Broekhuis, M. (2022). Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. *BMC health services research*, *10*(1), 231.

Caine, K., & Hanania, R. (2019). Patients want granular privacy control over health information in electronic medical records. *Journal of the American Medical Informatics Association*, *20*(1), 7-15.

Chaudhry B, Wang J, Wus, Maglione M, Mojice W, Ruth E, Morton JC, Shekule PG, (2021) Systematic Review: Impact of Health information technology on quality, efficiency and costs of medical care. London; Imperial College London. 144: 742 - 752

Chepkwony, M. C. (2019). *Factors Influencing the Adoption of Electronic Medical Records Technology in Public Health Institutions in Kenya: A Case of Hospitals in Nairobi County* (Doctoral dissertation, University of Nairobi).

Dehnarieh, R. Haghdoost, A, Khosravi, A, Hoseini, S, & Rad, M (2019). Electronic Medical Records in primary healthcare. An implementation experience in Iran, Health Information Management Journal, 48(2), 74 – 80

Derecho KC, Cafino R, Aquino-Cafino SL, Isla A Jr, Esencia JA, Lactuan NJ, Maranda JAG, Velasco LCP (2024) . Technology adoption of electronic medical records in developing economies: A systematic review on physicians' perspective.

Despins, L. A., & Wakefield, B. J. (2022). The Role of the Electronic Medical Record in the Intensive Care Unit Nurse's Detection of Patient Deterioration: A Qualitative Study. *CIN: Computers, Informatics, Nursing*, *36*(6), 284-292.

Gaponova, M. (2019). Analysis of ICT System In The Delivery Health Care Service-Case of Kalevala Hospital.

Gliem, J. A., & Gliem, R. R. (2003). Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales. Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education.

Hasanain, R. A. (2019). *Development of an EMR implementation framework for public hospitals in Saudi Arabia* (Doctoral dissertation, Queensland University of Technology).

Haskew, J., Rø, G., Turner, K., Kimanga, D., Sirengo, M., & Sharif, S. (2019). Implementation of a cloud-based electronic medical record to reduce gaps in the HIV treatment continuum in rural Kenya. *PLoS One*, *10*(8), e0135361.

Hsiao, C.J., & Hing, E. (2019). Adoption and use of Electronic Health Records by office -based health care providers and hospitals. United States, 2008 – 2019. National Centre for Health statistics, 187

Jawhari, B., Ludwick, D., Keenan, L., Zakus, D., & Hayward, R. (2021). Benefits and challenges of EMR implementations in low resource settings: a state-of-the-art review. *BMC medical informatics and decision making*, *16*(1), 116.

Kalayou M.H., Endehabtu B.F., Tilahun B. (2020) Journal of multidisciplinary Healthcare, 1827 – 1837

Kho, A.N., Pacheco, J.A., Peissig, P.L., Rasmussen, L., Newton, K.M., Weston, N., Crane, P.K., Pathak, J., Chute, C.G., Bielinski, S.J., & Kullo, I.J. (2019). Electronic medical records for genetic research: results of the eMERGE consortium. *Science translational medicine*, *3*(79), pp.79re1-79re1.

Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Age International.

Liuch, M. (2019) Health care professionals' organizational barriers to health information technologies- a literature review. International journal of medical informatics, 84(12), 1019 – 1035

Lium, J. T. (2007). Use of Electronic Medical Records and the road towards paperless hospitals in Norway. A socio-technical perspective.

Ludwick, D. A., & Doucette, J. (2021). Adopting electronic medical records in primary care: lessons learned from health information systems implementation experience in seven countries. *International journal of medical informatics*, *78*(1), 22-31.

McCarty, C.A., Chisholm, R.L., Chute, C.G., Kullo, I.J., Jarvik, G.P., Larson, E.B., Li, R., Masys, D.R., Ritchie, M.D., Roden, D.M., & Struewing, J.P. (2019). The eMERGE Network: a consortium of biorepositories linked to electronic medical records data for conducting genomic studies. *BMC medical genomics*, *4*(1), p.13.

Miller, A. R., & Tucker, C. (2021). Privacy protection and technology diffusion: The case of electronic medical records. *Management Science*, *55*(7), 1077-1093.

Mugo, D. M., & Nzuki, D. (2019). Determinants of electronic health in developing countries.

Mwangi, B. M. (2019). *Factors Influencing Adoption of ICT Strategy in the Kenyan Public Health Sector–A Case Study of the Kenyatta National Hospital* (Doctoral dissertation, United States International University-Africa).

Mwangi, C. (2020). Computerization of the Kenyan Health Care Records.

O'malley, A. S., Grossman, J. M., Cohen, G. R., Kemper, N. M., & Pham, H. H. (2022). Are electronic medical records helpful for care coordination? Experiences of physician practices. *Journal of general internal medicine*, *25*(3), 177-185.

Ochieng, O. G., & Hosoi, R. (2019). Factors influencing diffusion of electronic medical records: a case study in three healthcare institutions in Japan. *Health Information Management*, *34*(4), 120-129.

Overton, B. C. (2019). Examining Electronic Medical Records System Adoption and Implications for Emergency Medicine Practice and Providers.

Perera, G., Holbrook, A., Thabane, L., Foster, G., & Willison, D. J. (2019). Views on health information sharing and privacy from primary care practices using electronic medical records. *International journal of medical informatics*, *80*(2), 94-101.

Richardson, D. (2021). The successful implementation of electronic health records at small rural hospitals. *Walden University.*

Rogers, E. (2003). *Diffusion of Innovations*. Fifth edition. Free Press: New York.

Shachak, A., & Reis, S. (2021). The impact of electronic medical records on patient–doctor communication during consultation: a narrative literature review. *Journal of evaluation in clinical practice*, *15*(4), 641-649.

Taddese A., Lahmann J. (2017) Human Resources for Health in Kenya, A stock and flow review.

Wilke, R.A., Xu, H., Denny, J.C., Roden, D.M., Krauss, R.M., McCarty, C.A., Davis, R.L., Skaar, T., Lamba, J., & Savova, G. (2019). The emerging role of electronic medical records in pharmacogenomics. *Clinical Pharmacology & Therapeutics*, *89*(3), pp.379-386.

World Health Organization (2016) Global diffusion of EHealth; making Universal Health Care achievable

APPENDICES

Appendix I: Consent Form

My name is …….. I am a postgraduate student at Kenyatta University, School of Public Health and Applied Human Sciences, in the Department of Health Management and Informatics. I am planning to conduct a research study, which I invite you to take part in. The study is on "Diffusion of Electronic Medical Record towards achieving universal healthcare in selected Public Health Facilities in Kenya." The information will be used to strengthen workable practices and useful advice for those working with EMR.

Procedures to be followed

Participation in this study will require that I ask you some questions, and no procedure will be performed on you. You have the right to refuse participation in this study. You will give the same care and services whether you agree to join the study or not and your decision will not change the care/services you will receive or give from the hospital today or that you will get from any other hospital at any other time. Please remember that participation in the study is voluntary. You may ask questions related to the study at any time. You may refuse to respond to any questions, and you may stop an interview at any time. You may also stop being in the study at any time without any consequences to the services you receive from this clinic or any other organizations now or in the future.

Discomforts and Risks

There are no questions you will be asked that may be embarrassing or make you uncomfortable. But, if this happens, you may refuse to answer these questions if you choose so. You may also stop the interview at any time. The interview may add approximately half an hour to the time you wait before you receive your routine services.

Benefits

If you participate in this study you will help us to learn how to provide useful information that healthcare providers are missing out that can improve the health records of patients and increase the EMR adoption in the entire country; you will also benefit from being advised more on how to use it.

Reward

Participating in this study is voluntary, and therefore, no compensation will be given whatsoever.

Confidentiality

The interviews will be conducted within the offices. Your name will not be recorded on the questionnaire. The questionnaire will be kept in a locked cabinet for safe keeping at Kenyatta University. Everything will be kept private.

Contact information

If you have any questions you may contact ……. (principal investigator) on 0……..or the Kenyatta University Ethical Review Committee Secretariat on chairman.kuerc@ku.ac.ke, secretary kuerc@ku.ac.ke, ercku2008@gmail.com

Participant's Statement

The above information regarding my participants in the study is clear to me. I have been given a chance to ask questions, and my questions have been answered to my satisfaction. My participation in this study is entirely voluntary. I understand that I will still get the same care and services whether I decide to leave the study or not and my decision will

not change the care I will receive from the clinic today or that I will get from any other clinic at any other time.

Code of participant…….

……. …….

Signature **Date**

Investigator`s Statement

I, the undersigned, I have explained to the volunteer in a language she/he understands, the procedures to be followed in the study, and the risks and benefits involved.

Name of interviewer ……...

……. ……

Interviewer signature **Date**

Appendix II: Questionnaire

Title: THE DIFFUSION OF ELECTRONIC MEDICAL RECORD TOWARDS UNIVERSAL HEALTH CARE IN SELECTED PUBLIC HEALTH FACILITIES IN KENYA

Study ID: …… **Date**: ……/……/……...

Instructions: Do not write your name or any other personal data on the questionnaire.

Please follow instructions while answering questions in each area.

The information given here will remain confidential.

Part I: Socio-demographic Characteristics

1	What's your age? (In completed years)	[____]
2	What's your gender?	1.Male 2.Female
3	What is your current marital status?	1. Single 2. Married 3. Separated 4. Divorced 5. Widow
4	Which religion do you follow?	1. SDA 2. Muslim 3. Protestant 4. Catholic 5. Others (specify)……
5	What is your profession?	1. Doctor 2.Clinical Officer 3. Nurse 4. Admin Staff 5. Health Records and IT 6. Any other (specify)…….
6	What is your education level?	1. Postgraduate 2. Degree 3. Diploma 4. Certificate

		5. Others (specify)……..
7	How many years of working in this hospital?	1. 6 months to 1 Year 2. 1-3 years 3. 3-5 years 4. More than 5 years
8	How many years of professional experience?	1. 0-3 2. 3-5 3. 5-8 4. 8-10 5. More than 10

Part II: Level of Technology Use

	What is your level of knowledge of computer applications in Clinical practice	1.Great 2 Moderate 3.Low
	Are you currently using EMR?	1. Yes 2. No
	If YES above, is it Voluntarily?	1. Yes 2. No
	If No in question 9, why?	1.Time consuming 2. Mostly not functional 3. Other (specify).....
	Is the EMR you use networked with other departments?	1. Yes 2. No
	Who is responsible for assigning access and security privileges to staff?	1. Physician 2. Office manager 3. All staff 4. Others (specify).....
	What would you say is the degree of EMR system diffusion from one department to the other	1.Fully diffused 2.Partially electronic and partially paper 3.Not diffused

Indicate to which extent the following services are conducted under Electronic Medical Records in your organisation

	Function	Very High	High	Average	Low	Very low
16	Scheduling of appointments					
17	Writing prescriptions					
18	Registration of patients					
19	Storage of patient's information					
20	Recording consultations					
21	Writing of patient summaries					
22	Decision support system					
23	Finance management					
24	Billing and payments					
25	Making insurance claims					
26	Staff payroll					

Any other comments on usage of EMR technology?----------

Part III: Healthcare Workers Individual Characteristics

	To what extent does lack of training influence the use of ICT strategy in your organization?	a) Very great extent b) Great extent c) Moderate extent d) Less extent e) Not at all
	To what extent do you use EMR per day?	a) Less than 20% b) 21% to 40% c) 41% to 60% d) 61% to 80% e) More than 81%
	To what extent does effective leadership influence the diffusion of EMR in this facility?	a) Very great extent b) Great extent c) Moderate extent d) Less extent e) Not at all
	EMR is time consuming per patient	a) Yes b) No
	EMR is worth than paper records	a) Yes b) No
	What is the level of understanding on working with EMR system	a) Very high b) High c) Fair d) Low e) Very Low
	What can you say on your computer literacy levels	a) Very high b) High c) Fair d) Low e) Very Low
	What is the adequacy of technical staffs who have knowledge on operating information technology systems in your hospital	a) Very high b) High c) Fair d) Low e) Very Low

Any other comment on individual characteristics----------

Part IV: Organizational Factors

To what extent do you agree on the following statements regarding the influence of resource availability on diffusion and sustainability of electronic medical records (EMR) technology at your health facility? Scale: (1) Strongly agree (SA), (2) agree (A), (3) uncertain (4) Disagree (DA) and (5) Strongly Disagree (SD).

	Factor	1	2	3	4	5
35	Lack of adequate infrastructure affects the EMR sustainability					
36	Cost of EMR resources and facilities purchase is the greatest barrier to its adoption and sustainability					
37	Lack of technical personnel to install and operate EMR technology resources is an impediment to its sustainability					
38	Maintenance costs of EMR technology facilities hinder its sustainability and utilisation in our institution					
39	Inadequate sources of funding inhibit EMR technology sustainability in our organisation					
40	The consistency rate of internet connection (bandwidth) at your hospital inhibit EMR technology sustainability					
41	Level of understanding on working under EMR system is affecting EMR diffusion and its sustainability					
42	Lack of policies and guidelines affect the diffusion of EMR					

Any other comment on organisational factors----------

Part V: Technological Factors

	Factor	**Yes**	**No**
	The fear of using technology is a barrier to the diffusion of EMR systems by health care professionals.		
	Lack of training new hospital staff on EMR usage & operations		
	Lack of technical personnel to install and operate EMR technology resources is an impediment to its sustainability		
	Lack of time due to day-today work load		
	Absence of computer skills amongst health care staff		
	Legal concerns such as security and patient's privacy affect the diffusion of EMR		
	Inadequate data exchange between departments		
	Inadequate internet bandwidth is a notable challenge to diffusion of EMR		
	Poor communication between various players affect the diffusion of EMR		

Any other comment on technological factors----------

Thank you very much for your participation and completing this questionnaire

Appendix III: Key Informant Guide

1. How many departments are linked to EMR technology?
2. Is there a disaster recovery plan?
3. How are medical records recovered under this plan?
4. How do you Support to practice – whom do you call, when things break or go wrong?
5. What are the strong points in the EMR (for IT professionals in hospitals and health bureau)?
6. How would you express the practice? Utilization, perception and privacy and confidentiality in your hospital.
7. Have you done any assessment on the diffusion?
8. Do you have policies and guidelines guiding adoption and diffusion of EMR?
9. Do you supervise the diffusion process?
10. What are the effects of EMR on service delivery?
11. Do you provide supports for the users (health professionals and supportive team) in the use of the system?
12. What are the frequent supports that the users request for?
13. Would you get any support from any donor? who are supporters
14. What kind of support do you get from donors?
15. Are there any barriers to sustainable diffusion of EMR?
16. Is there any point or issue that should be mentioned or discussed?

Appendix IV: Graduate School Research Approval

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke
P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Internal Memo

FROM: Dean, Graduate School DATE: 12th March, 2019

TO: Ms. Maryanne Wanjuhi Muritu REF: Q141/CE/26174/2014
C/o Department of Health Management
& Informatics

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

We acknowledge receipt of your Research Proposal after fulfilling recommendations raised by the Graduate School Board of 30th January, 2019.

You may now proceed with your Data collection, subject to clearance with the Director General, National Commission for Science, Technology & Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking Forms per semester. The form has been developed to replace the Progress Report Forms. The Supervision Tracking Forms are available at the University's Website under Graduate School webpage downloads.

Thank you.

HARRIET ISABOKE
FOR: DEAN, GRADUATE SCHOOL

CC. Chairman, Department of Health Management & Informatics

Supervisors:

1. Dr. George O. Otieno
   C/o Department of Health Management & Informatics
   Kenyatta University

2. Dr. Kenneth Rucha
   C/o Department of Health Management & Informatics
   Kenyatta University

HI/cww

KENYATTA UNIVERSITY
OFFICE OF THE CHAIRMAN
18 MAR 2019
DEPARTMENT OF HEALTH MANAGEMENT & INFORMATICS
P.O. Box 43844, NAIROBI

Appendix V: Graduate School Research Authorization

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Our Ref: Q141/CE/26174/2014

DATE: 12th March, 2019

Director General,
National Commission for Science, Technology
and Innovation
P.O. Box 30623-00100
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR MS. MARYANNE WANJUHI MURITU – REG. NO. Q141/CE/26174/2014

I write to introduce Ms. Maryanne Wanjuhi Muritu who is a Postgraduate Student of this University. She is registered for M.Sc. degree programme in the **Department of Health Management & Informatics.**

Ms. Muritu intends to conduct research for a M.Sc. thesis Proposal entitled, **"The Diffusion of Electronic Medical Record Towards Universal Health Care at the Outpatient Department in Selected Public Health Facilities in Kenya."**

Any assistance given will be highly appreciated.

Yours faithfully,

PROF. ELISHIBA KIMANI
DEAN, GRADUATE SCHOOL

HI/cww

KENYATTA UNIVERSITY
OFFICE OF THE CHAIRMAN
10 MAR 2019
DEPARTMENT OF HEALTH MANAGEMENT & INFORMATICS
P.O. Box 43844, NAIROBI

Appendix VI: Kenyatta University Ethical Review Committee

KENYATTA UNIVERSITY
ETHICS REVIEW COMMITTEE

Fax: 8711242/8711575
Email: chairman.kuerc@ku.ac.ke
kuerc.secretary@ku.ac.ke
Website: www.ku.ac.ke

P. O. Box 43844,
Nairobi, 00100
Tel: 8710901/12

Our Ref: KU/ERC/ APPROVAL/VOL.1 (249) Date: 31st May, 2019

Maryanne Wanjuhi Muritu
P.0 Box 43844-00100
Nairobi

Dear Ms. Muritu,

APPLICATION NUMBER: PKU/1008/11058 THE DIFFUSION OF ELECTRONIC MEDICAL RECORD TOWARDS UNIVERSAL HEALTH CARE AT THE OUTPATIENT DEPARTMENT IN SELECTED PUBLIC HEALTH FACILITIES IN KENYA

1. IDENTIFICATION OF PROTOCOL

The application before the committee is with a research topic **"The Diffusion Of Electronic Medical Record Towards Universal Health Care At The Outpatient Department In Selected Public Health Facilities In Kenya"** received on 8th April, 2019 and discussed on 14th May, 2019

2. APPLICANT

Maryanne Wanjuhi Muritu

3. SITE

Selected Public Health Facilities In Kenya

4. DECISION

The committee has considered the research protocol in accordance with the Kenyatta University Research Policy (section 7.2.1.3) and the Kenyatta University Ethics Review Committee Guidelines and **APPROVED that the research may proceed for a period of ONE year from 14th May, 2019**

5. **ADVICE/CONDITIONS**

i. Progress reports are submitted to the KU-ERC every six months and a full report is submitted at the end of the study.
ii. Serious and unexpected adverse events related to the conduct of the study are reported to this committee immediately they occur.
iii. Notify the Kenyatta University Ethics Committee of any amendments to the protocol.
iv. Submit an electronic copy of the protocol to KUERC.

When replying, kindly quote the application number above.
If you accept the decision reached and advice and conditions given please sign in the space provided below and return to KU-ERC a copy of the letter.

KENYATTA UNIVERSITY OFFICE OF THE CHAIRMAN 31 MAY 2019 ETHICS REVIEW COMMITTEE P.O. BOX 43844 - 00100 NAIROBI

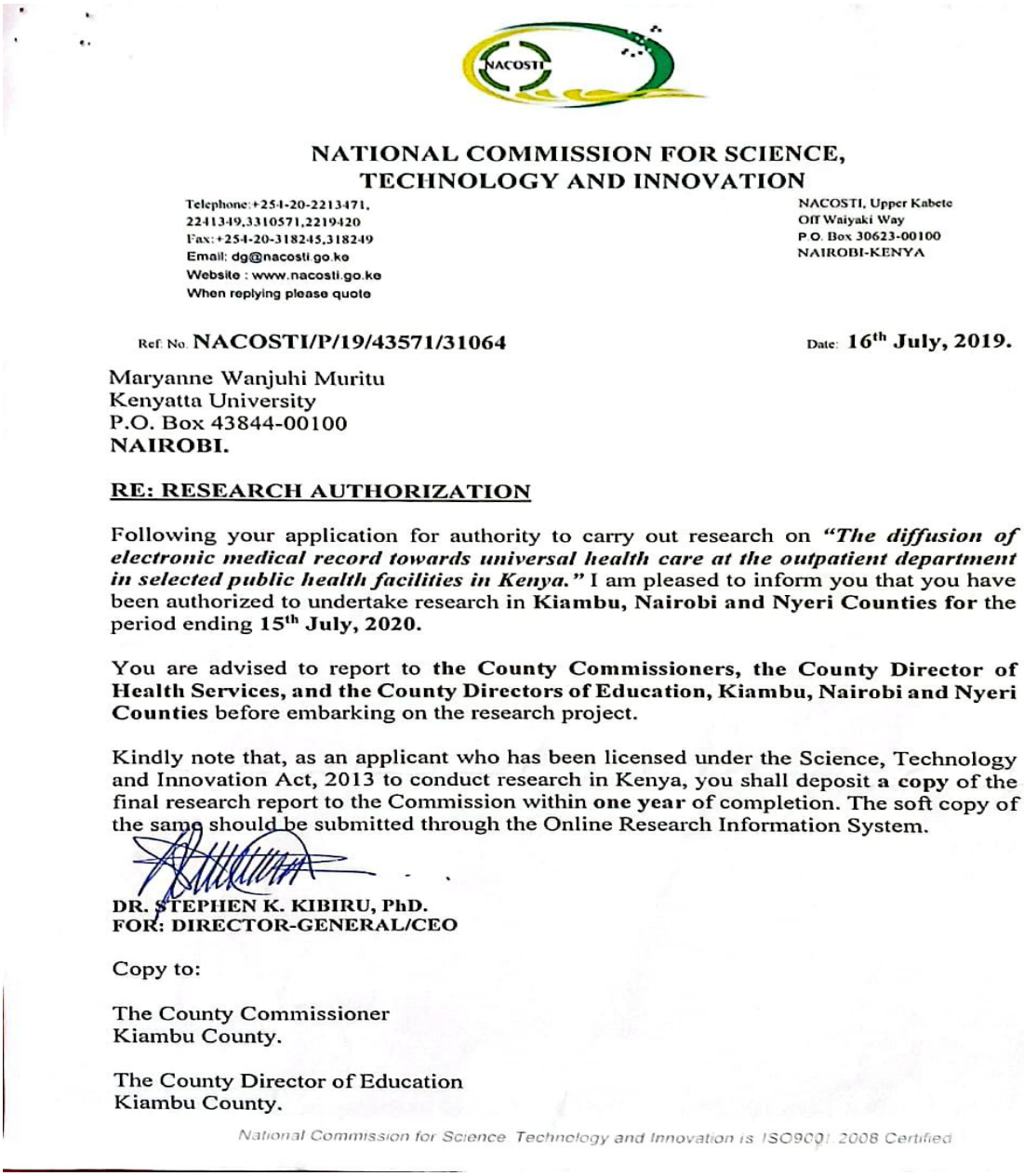
PROF. JUDITH KIMIYWE
CHAIRMAN ETHICS REVIEW COMMITTEE

I ..Mary Anne M. Muriithi..accept the advice given and will fulfill the conditions therein.

Signature.....Mel..... Dated this day of....31/05/2019..... 2019.

cc.
DVC-Research Innovation and Outreach

Appendix VII: NACOSTI License



NATIONAL COMMISSION FOR SCIENCE,
TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471,
2241349,3310571,2219420
Fax:+254-20-318245,318249
Email: dg@nacosti.go.ke
Website : www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref. No. **NACOSTI/P/19/43571/31064**

Date: **16th July, 2019.**

Maryanne Wanjuhi Muritu
Kenyatta University
P.O. Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"The diffusion of electronic medical record towards universal health care at the outpatient department in selected public health facilities in Kenya."*** I am pleased to inform you that you have been authorized to undertake research in **Kiambu, Nairobi and Nyeri Counties for** the period ending **15th July, 2020.**

You are advised to report to **the County Commissioners, the County Director of Health Services, and the County Directors of Education, Kiambu, Nairobi and Nyeri Counties** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

DR. STEPHEN K. KIBIRU, PhD.
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Kiambu County.

The County Director of Education
Kiambu County.

THIS IS TO CERTIFY THAT:
MS. MARYANNE WANJUHI MURITU
of KENYATTA UNIVERSITY, 0-10200 Muranga,has been permitted to conduct research in *Kiambu , Nairobi, Nyeri Counties*

on the topic: *THE DIFFUSION OF ELECTRONIC MEDICAL RECORD TOWARDS UNIVERSAL HEALTH CARE AT THE OUTPATIENT DEPARTMENT IN SELECTED PUBLIC HEALTH FACILITIES IN KENYA*

for the period ending:
15th July,2020

.....
Applicant's Signature

Permit No : NACOSTI/P/19/43571/31064
Date Of Issue : 16th July,2019
Fee Recieved :Ksh 1000

.....
Director General
National Commission for Science, Technology & Innovation

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013

The Grant of Research Licenses is guided by the Science, Technology and Innovation (Research Licensing) Regulations, 2014.

CONDITIONS

1. The License is valid for the proposed research, location and specified period.
2. The License and any rights thereunder are non-transferable.
3. The Licensee shall inform the County Governor before commencement of the research.
4. Excavation, filming and collection of specimens are subject to further necessary clearance from relevant Government Agencies.
5. The License does not give authority to transfer research materials.
6. NACOSTI may monitor and evaluate the licensed research project.
7. The Licensee shall submit one hard copy and upload a soft copy of their final report within one year of completion of the research.
8. NACOSTI reserves the right to modify the conditions of the License including cancellation without prior notice.

National Commission for Science, Technology and Innovation
P.O. Box 30623 - 00100, Nairobi, Kenya
TEL: 020 400 7000, 0713 788787, 0735 404245
Email: dg@nacosti.go.ke, registry@nacosti.go.ke
Website: www.nacosti.go.ke

REPUBLIC OF KENYA

National Commission for Science, Technology and Innovation

RESEARCH LICENSE

Serial No.A 25851

CONDITIONS: see back page

Appendix VIII: Nyeri County Commissioner Research Authorization

OFFICE OF THE PRESIDENT
MINISTRY OF INTERIOR AND CO-ORDINATION OF NATIONAL GOVERNMENT

E-mail: nyericountycommissioner@yahoo.com
Telephone: 061 2030619/20
Fax: 061 2032089
When replying please quote

COUNTY COMMISSIONER
NYERI COUNTY
P.O. Box 33-10100
NYERI

REF: NYC/ADM/1/57/VOL. VIII/73 **16th July, 2019**

Maryanne Wanjuhi Muritu
Kenyatta University
P O Box 43844 - 00100
NAIROBI

RE: RESEARCH AUTHORIZATION

Reference is made to the letter Ref. NACOSTI/P/19/43571/31064 dated 16th July, 2019 on the above subject.

Approval is hereby granted to carry out research on the topic: **The diffusion of Electronic medical record towards Universal Health care at the outpatient department in selected Public facilities** in Nyeri County.

The periods of the research ends on 15th July, 2020.

Fred N. Mwangangi
For: County Commissioner
NYERI COUNTY

COUNTY COMMISSIONER
NYERI COUNTY

Appendix IX: Nyeri County Ministry of Education Research Authorization

REPUBLIC OF KENYA

MINISTRY OF EDUCATION
STATE DEPARTMENT OF EARLY LEARNING AND BASIC EDUCATION

E-Mail –centralpde@gmail.com
Telephone: Nyeri (061) 2030619
When replying please quote

OFFICE OF THE COUNTY
DIRECTOR OF EDUCATION
P.O. Box 80 - 10100,
NYERI

CDE/NYI/GEN/23/VOL.IV/68

16th July, 2019

Maryanne Wanjuhi Muritu
Kenyatta University
P.O Box 43844-00100
NAIROBI

RE: RESEARCH AUTHORIZATION.

Reference is made to Secretary National Commission for Science, Technology and Innovation Research License No: NACOSTI/P/19/43571/31064 issued on 16th July, 2019 on the above subject.

I wish to inform you that you have been given authority to do research on **"The diffusion of electronic medical record towards universal health care at the outpatient department in selected public health facilities in Kenya." for the period ending 15th July, 2020.**

For: COUNTY DIRECTOR OF EDUCATION
NYERI
P. O. Box 80 - 10100, NYERI
Tel: 061-2030688

SAMMY NG'ANG'A
FOR: COUNTY DIRECTOR OF EDUCATION
NYERI

Copy to:

National Commission for Science,
Technology and Innovation,
P.O. Box 30623-00100
NAIROBI

Appendix X: Nyeri County Ministry of Health services Research Authorization

REPUBLIC OF KENYA

COUNTY GOVERNMENT OF NYERI
DEPARTMENT OF HEALTH SERVICES
OFFICE OF THE DIRECTOR

Email: nyericountyhealth@yahoo.com

COUNTY COMMISSIONER'S HQ
BLOCK 'A'
P.O. Box 110 - 10100

REF: CGN/HEALTH/HRM/5/VOL.II **Date: 28th July 2019**

TO WHOM IT MAY CONCERN

RE: RESEARCH AUTHORIZATION

The bearer of this letter, **Maryanne Wanjuhi Muritu** is a student at Kenyatta University department of Health Management & Informatics.

She has written to this office requesting for authority to carry out data collection for research entitled **"The diffusion of electronic medical record towards universal health care at the outpatient department in selected public health facilities in Kenya"**.

The office has no objection and consent has been given. Kindly accord her the necessary assistance.

The student must deposit a copy of the final report with the department following completion of the study.

COUNTY DIRECTOR OF HEALTH

Date.....
Dr. Oscar Agoro
For: County Director for Health
NYERI

Appendix XI: Kiambu County Commissioner Research Authorization

OFFICE OF THE PRESIDENT
MINISTRY OF INTERIOR AND CO-ORDINATION OF NATIONAL GOVERNMENT

Email:kiambucountycommissioner@gmail.com
Telephone: 061 2030619/20
Fax 061 2032089
When replying please quote

COUNTY COMMISSIONER
KIAMBU COUNTY
P.O.BOX 33-00900
KIAMBU

Ref: KBU/ADM/3/64/VOL.IX/76

Maryanne Wanjuhi Muritu
Kenyatta University
P.O. Box 43844 – 00100
NAIROBI

RE: RESEARCH AUTHORIZATION
Reference is made to the letter Ref. **NACOSTI/P/19/43571/31064** dated 16th July, 2019 on the above subject.

Approval is hereby granted to carry out research on the topic ''The diffusion of Electronic medical records towards Universal Health care at the outpatient department in selected Public facilities''.

The periods of the research ends on 15th July, 2020.

COUNTY COMMISSIONER
KIAMBU COUNTY

Wilson Wanyaga
For: County Commissioner
KIAMBU COUNTY

Appendix XII: Kiambu County Ministry of Education Research Authorization

REPUBLIC OF KENYA

MINISTRY OF EDUCATION
STATE DEPARTMENT OF EARLY LEARNING AND BASIC EDUCATION

Email:kiambueducation@gmail.com
Telephone: (0)3318581
Email: info@*education*.go.ke
When replying please quote

OFFICE OF THE COUNTY
DIRECTOR OF EDUCATION
P.O. Box 300400-00100
KIAMBU

CDE/KBU/48/VOL.V/84

16TH July, 2019

Maryanne Wanjuhi Muritu
Kenyatta University
P.O Box 43844-00100
NAIROBI

RE: RESEARCH AUTHORIZATION

Reference is made to secretary National Commission for Science, Technology and Innovation Research License No: **NACOSTI/P/19/43571/19/43571/31064** issued on 16th July, 2019 on the above subject.

I wish to inform you that you have been given authority to do research on "The diffusion of electronic medical record towards universal health care at the outpatient department in selected public health facilities in Kenya" Kiambu County for the period ending 15th July, 2020

COUNTY DIRECTOR OF EDUCATION KIAMBU P.O. BOX 300400-00100 KIAMBU

Roselyne Wanjiku
FOR: COUNTY DIRECTOR OF EDUCATION
KIAMBU

Appendix XIII : Kiambu County Ministry of Health services Research Authorization

COUNTY GOVERNMENT OF KIAMBU
DEPARTMENT OF HEALTH SERVICES

All correspondence should be addressed to
HEAD HRDU- HEALTH DEPARTMENT
Email address mndru@gmail.com

HEALTH RESEARCH AND DEVELOPMENT UNIT
P.O.BOX 2344-00900
KIAMBU

Ref: No. KIAMBU /HRDU/AUTHO/2019 /07/01/Maina DM

TO WHOM IT MAY CONCERN

Date:25/07/2019

RE: CLEARANCE TO CONDUCT RESEARCH IN KIAMBU COUNTY

Kindly note that we have received a request by Ms. MaryAnne Muritu of Kenyatta University to carry in Kiambu County the research topic being ***'THE DIFFUSION OF ELECTRONIC MEDICAL RECORDS TOWARDS UNIVERSAL HEALTH CARE AT THE OUTPATIENT DEPARTMENT IN SELECTED PUBLIC FACILITIES''.***

We have duly inspected her documents and found that she has been cleared by Kenya University Ethics Review Committee and National commission for Science, Technology and innovation until 15th July 2020. She thus does not need any further clearance with another regulatory body in order to conduct research within Kiambu County.

However, it is incumbent upon the facility in which the research is being carried out to ensure that they are conversant with the remit of the study and operate in line with their institutional norms on conducting research. This note also accords her the duty to provide feedback on her research to the county at the conclusion of her research.

KIAMBU COUNTY
OF HEALTH SERVICES
FOR: COUNTY DIRECTOR

Dr. Patrick Nyaga
For; COUNTY HEALTH RESEARCH DEVELOPMENT UNIT
KIAMBU COUNTY

Appendix XIV: Nairobi County Commissioner Research Authorization

OFFICE OF THE PRESIDENT
MINISTRY OF INTERIOR AND CO-ORDINATION OF NATIONAL GOVERNMENT

Email:nairobicountycommissioner@gmail.com
Telephone: 0720 568455

COUNTY COMMISSIONER
NAIROBI COUNTY
P.O. Box 55704 - 00200
NAIROBI

Maryanne Wanjuhi Muritu
Kenyatta University
P.O. Box 43844-00100
NAIROBI

RE: RESEARCH AUTHORIZATION

Reference is made to the letter Ref. **NACOSTI/P/19/43571/31064** dated 16th July, 2019 on the above subject.

Approval is hereby granted to carry out research on the topic ''**The diffusion of Electronic medical records towards Universal Health care at the outpatient department in selected Public facilities**'' Nairobi County.

The periods of the research end son 15th July, 2020.

Mawira Mungania
For: County Commissioner
NAIROBI COUNTY

COUNTY COMMISSIONER
NAIROBI COUNTY

Appendix XV: Nairobi County Ministry of Education Research Authorization

Email:psbasiceducation@gmail.com
Telephone: 020 3318581

When replying please quote

CDE/NRB/35/VOL.IV/67

OFFICE OF THE COUNTY
DIRECTOR OF EDUCATION
P.O.BOX 36260-00200
NAIROBI

16TH July, 2019

Maryanne Wanjuhi Muritu
Kenyatta University
P.O Box 43844-00100
NAIROBI

RE: RESEARCH AUTHORIZATION

Reference is made to secretary National Commission for Science, Technology and Innovation Research License No: NACOSTI/P/19/43571/19/43571/31064 issued on 16th July, 2019 on the above subject.

I wish to inform you that you have been given authority to carry out research on ''The diffusion of electronic medical record towards universal health care at the outpatient department in selected public health facilities in Kenya''in Mbagathi Hospital for the period ending 15th July, 2020

Hesbon Nyagaka
FOR: COUNTY DIRECTOR OF EDUCATION
NAIROBI

FOR: COUNTY DIRECTOR
OF EDUCATION NAIROBI
P.O. BOX 36260-00200, NAIROBI
TEL: 020 3318581

Appendix XVI: Nairobi County Ministry of Health services Research Authorization

REPUBLIC OF KENYA

COUNTY GOVERNMENT OF NAIROBI
DEPARTMENT OF HEALTH SERVICES OFFICE OF THE DIRECTOR

Email: nairobihealth@gmail.com

COUNTY COMMISSIONER'S HQ
P.O.BOX 55704 – 00200

REF: CGN/HEALTH/HRM/1/VOL.14 **Date: 28th July 2019**

RE: RESEARCH AUTHORIZATION

The bearer of this letter, Maryanne Wanjuhi Muritu is a student at Kenyatta University department of Health Management & Informatics.

She has written to this office requesting for authority to carry out data collection for research entitled **'The diffusion of electronic medical record towards universal health care at the outpatient department in selected public health facilities in Kenya''** Mbagathi Hospital.

The office has no objection and consent has been granted. Kindly accord her the necessary assistance.

The student **must** deposit a copy of the final report with the department following completion of the study.

Dr. Hassan Said
For; County Director for Health
Nairobi

FOR: COUNTY DIRECTOR
OF HEALTH SERVICES
NAIROBI COUNTY

Appendix XVII: Map of the study area