

**FACILITATORS AND BARRIERS TO THE ADOPTION OF  
ELECTRONIC MEDICAL RECORD SYSTEMS BY HEALTHCARE  
PROVIDERS IN HIV CLINICS, IN KISUMU COUNTY, KENYA.**

**BY**

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## DECLARATION

### 1. Student Declaration

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### 2. Declaration by Academic Supervisors

This research thesis has been submitted to IREC for review with our approval as the university academic supervisors.

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## **DEDICATION**

I devote this research project to my mother Naomi Mumbi Kamau whose words made me work hard to achieve what she did not. To my husband Michael Otieno for his inspiration and encouragement to keep pushing hard and not give up. To my children Heri, Chane and Zali who have been affected in every way possible by this quest. I further dedicate this research project to my brothers and sisters for their effortless support during this period of my master's program.

## **FACILITATORS AND BARRIERS TO THE ADOPTION OF ELECTRONIC MEDICAL RECORD SYSTEMS BY HEALTHCARE PROVIDERS IN HIV CLINICS, IN KISUMU COUNTY, KENYA.**

### **ABSTRACT**

**Background:** EMRs adoption faces numerous challenges and the benefits in healthcare delivery in Kenya remain scanty; particularly in HIV/AIDS treatment and management. Consequently, it was important to identify enabling factors and perceived barriers by healthcare providers towards EMR use in HIV clinics

**Objective:** The study investigated factors that influence healthcare providers' use of EMR in HIV clinics in Kisumu County. The specific objectives were to describe facilitators to the use of EMR and to explore barriers to the use of EMR by healthcare providers working in HIV clinics in Kisumu County.

**Study Site:** HIV clinics in Kisumu County, Kenya

**Study design:** This study employed a qualitative research design. In-depth interviews were used to elicit views on reasons for and against EMR use, using an interview guide.

**Subjects:** Clinical officers and nurses.

**Methods:** The participants for this study were purposively selected from 18 HIV clinics and had to have interacted with an EMR for at least 6 months prior to the data collection period. Data was audio recorded, transcribed, and content analysis performed using both deductive and inductive codes. Themes generated were organized using the Andersen-Newman Framework of Health Services Utilization. This framework permits systematic identification of factors that influence individual decisions to use (or not use) available health care services. Facilitators and barriers were categorized as predisposing characteristics, enabling/disabling resources and need factors.

**Results:** A total of 42 participants were interviewed; clinical officers (n=27) and nurses (n=15). Facilitators of EMR use include personal initiative, ease of EMR operation, Human Resource Information Officers (HRIO's), technical support, environmental factors, management support, capacity building and resource availability. Barriers identified were: negative attitude, resource scarcity, intermittent connectivity, EMR technical issues, unstable electricity, staff rotations, inadequate training, lack of support supervision from County Health Management Team (CHMT), workload, integration of services, ergonomic support, poor infrastructure and time factor.

**Conclusion:** Factors influencing EMR use were identified such as personal initiative, attitude, management support, ease of EMR operation, heavy workload and hardware support. With this knowledge, policy makers, Ministry of Health and EMR implementors can potentially formulate mechanisms that can be put in place to enhance the facilitators as well as address the barriers for successful EMR adoption.

**Recommendation:** The study findings suggest that to enhance EMR use, intervention mechanisms that stakeholders can adopt include organizing for refresher training, providing adequate computer resources, enacting policies to support integration of health services at the clinics and include EMR support

supervision as an element of CHMT evaluation.

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## ACRONYMS

<b>ARV</b>	Antiretroviral
<b>CHMT</b>	County Health Management Team
<b>EMR</b>	Electronic Medical Record
<b>HCP</b>	Health Care Provider
<b>HIV</b>	Human Immunodeficiency Virus
<b>ICT</b>	Information Communication and Technology
<b>LMIC</b>	Low Middle-Income countries
<b>NGO</b>	Non-Governmental Organizations

## DEFINITION OF TERMS

**Adoption** – Refers to the usage of the EMR.

**Barriers to the use of EMR-** Factors that hinder/prevent adoption of EMR by healthcare providers

**Electronic Medical Records-** digital input and storage of patient information that is collected by healthcare providers

**Facilitators to the use of EMR-** Factors that promote/accelerate adoption of EMR by healthcare providers

**Healthcare providers** – Clinicians or nurses working at HIV Clinics

**HIV Clinics-** Health centers aiding with HIV/AIDS care and treatment.

## CHAPTER ONE: INTRODUCTION

### 1.1 Background

When patients visit health facilities to seek medical services, clinicians and nurses collect various pieces of data from them. These medical records are legal documents in patients' care. Data collected include body temperature, weight, blood pressure, clinical notes of the presenting condition, laboratory tests ordered, any allergies that the patients may disclose, and the treatment plan (including medications being prescribed). Record keeping is an integral part of medical care and traditionally, physicians have been using paper such as registers and paper charts to collect patient information, and much of the data collection is focused on reporting requirements rather than patient care. The mode of collecting data from patients varies between health facilities depending on resources and the requirements and preferences of stakeholders.

There are several limitations associated with paper-based patient records including: illegible handwriting from some clinicians can contribute to medical errors, a single copy of the paper record so if it is lost the clinician will not have a clinical history of the patient, paper records are susceptible to unplanned destruction like rodents, fire or flooding, the process of manually tabulating data for reporting purposes is labor-intensive and records cannot be easily retrieved when there is need for urgent decision making for patients (Ajami & Bagheri-Tadi, 2013a). To minimize these challenges, Electronic Medical Record (EMR) was introduced tool to simplify reporting, improve clinic efficiency and enhance patient (Liang et al., 2021).

The National Alliance for Health Information Technology defines EMR as the electronic record of health-related information on an individual that can be created, gathered, managed, and consulted by authorized clinicians and staff within one health care organization. The key components of an ideal EMR are: clinical data repository, controlled medical vocabulary, clinical workflow, decision support, clinical management, document and data capture, physician order entry and display dashboard (Gyamfi et al., 2017). In health facilities, there are a variety of electronic information systems that help in patient care, including laboratory information systems which supports laboratory operations, and picture archiving and information systems that provides storage and access to images from different modalities and EMR (Muinga et al., 2020). When EMR systems are available, making safe and appropriate diagnostic and treatment decisions entails actually accessing information (e.g., problem lists, prior notes, test results) in the EMR rather than relying on memory or outdated handwritten notes.

Currently EMRs are implemented in hospitals, because of the exciting promise of accurate, real-time access to patient health care data, substantially reducing the risk of medication errors and adverse drug events (Jawhari, Ludwick, et al., 2016). They also have tangible benefits in cost savings and patient safety making them especially relevant for Low Middle- Income Countries (LMICs). Despite the many benefits of EMR implementation, there are limitations sighted. A study in Canada identified factors that influence implementation including: motivation, participation of end users in implementation; lack of time and workload; interaction between the patient and clinical staff; and perceived usefulness (Farzianpour et al., 2015). The



health care sector is an area of social and economic interest in many countries and thus the efforts to use EMRs. Developed countries like the United States, United Kingdom, Europe and Canada have set the trend to initiate the development of the computerized system. These countries were able to adopt EMR system faster due to the stimulus package offered by the government to HCP when they demonstrated that the EMR have been used to improve care and increase efficiencies' (Muinga et al., 2018).

Developing countries are a diverse group with different concerns and views. These are countries with low level of economy growth and inadequate technical and social infrastructure, thus the use of EMR is faced with many challenges and barriers. Countries have to allocate most of their valuable and limited financial resources to EMR while they do not have a national strategic plan which is clear and realistic (Hassibian, 2013). There is limited documented experience on the use of EMR in Low Middle-Income Countries (LMICs). In Sub-Saharan Africa, EMR deployment has been sparse and often limited to HIV care clinics and other infectious disease like pneumonia. The push to use EMR in HIV sector has been attributed by the need to report data by government and donor funding agencies like US Center for Disease Control and Prevention (Gyamfi et al., 2017). Examples of such countries that have implemented EMR are; Lilongwe in Malawi, Careware in Uganda, Partners in Health -Rwanda and AMRS- Kenya (Fraser et al., 2005).LMIC's mainly use open-source software for EMR to avoid the high cost of software licensing. Data that has been collected over time implies that the rate of EMR adoption in LMICs is very low (Ajami & Bagheri-Tadi, 2013a).

In Kenya, the donor funding agencies and the government have put substantial

effort in implementing EMR in public health facilities providing HIV care as stated by Muinga 2018.

Some of the efforts put in place include: having technical personnel to support EMR; providing uninterruptible power supply to support the desktops to curb frequent power blackouts; purchase of mobile devices that can sustain power for long hours; and training healthcare providers to use the EMR effectively. Despite all these efforts, health facilities continue to struggle with adopting EMR systems and using the technology meaningfully in providing care to patients. Meinert implies that the reason for the slow uptake of EMR adoption is primarily due to lack of motivation from the healthcare provider. The resistance of healthcare providers towards adoption and use of the system is among the important barriers to successful implementation and adoption (Farzianpour et al., 2015).

Health care providers are crucial in the use of the EMR. They interact with the patients and EMR and are at advantage position to provide much of the information that the systems automate. Several studies in the developed countries have identified facilitators and barriers to EMR adoption such as cost and difficulty procuring the system, physician resistance, and organizational characteristics (e.g., hospital size, ownership, and teaching status). However, there is scarcity of research, particularly in developing countries, that reveals what facilitates or impedes EMR use once EMR has been made available at a health facility. The purpose of this study is to describe healthcare providers perceptions regarding the barriers and facilitators of adopting EMR. In this study, adoption is defined as the actual uptake and use of the EMR.

## **1.2 Problem Statement**

Whenever a patient visits a healthcare center, information is captured. This information might be in the form of paper or in an electronic format. In developing countries, many of the hospitals providing HIV care record patient information using a mix of paper and EMR. EMR adoption in the health facilities has been slow and thus a critical challenge to reap the benefits envisioned with EMR implementation. Documented EMR benefits include patient safety, quality of care and clinic efficiency as well as supporting healthcare professionals in their decision-making (Liang et al., 2021). Donors, implementing partners, MOH and County Health Management Team (CHMT) have invested heavily in terms of human capital, computer resources and infrastructure to ensure that the EMR systems are available in HIV clinics (Muinga et al., 2018). However, when implementing partners visit the facilities on EMR progress, they are confronted with a mix of reactions; some health facilities have healthcare providers who use it, while in some facilities HCP do not use it.

Various scholars have investigated EMR adoption, however, most of the studies reviewed were divergent in terms of context, concept and methods. For instance a study conducted in a developed country by (El Mahalli, 2015) in Saudi Arabia used questionnaires to get views from nurses on what makes them adopt EMR and the associated barriers; thereby creating a gap in the methodology.

In Sub Saharan Africa a study by (Msiska et al., 2017) in Malawi focused on

utilization of EMR in hospitals and found an association between socio-demographic factors and use of EMR. However, the study was done in Malawi and not Kenya thus, a contextual gap. In Kenya, several empirical studies such as (Njoroge, 2014); (Jawhari, Keenan, et al., 2016) exist that have identified factors which promote the use of EMR with identified variables that promote or hinder the use of EMR but lack a perspective from healthcare providers such as clinical officers and nurses. Therefore, this study is sought to get views from healthcare providers who are known to be the biggest puzzle towards EMR uptake. Healthcare providers' perspective will provide great insight which can be used to identify appropriate strategies for more efficient and effective EMR uptake.

### **1.3 Justification**

Donor funding agencies and government have been at the forefront in the implementation of EMR in public health facilities. Muinga 2018 stated that a lot of heavy investment resources such as purchasing of hardware cost (computers, mobile devices, power banks) and human resource costs (training healthcare providers and hiring of technical personnel to support the EMR) have been put into place to promote the use of EMR health facilities. This study seeks to find out with the heavy investment already put in the HIV health facilities, what are the factors that facilitate the use of EMR and which are the barriers associated with EMR adoption from the healthcare providers' perspective. There are no studies to the knowledge of the investigator that have been done to investigate the perspective of healthcare providers in EMR adoption in HIV clinics in Kisumu County.

Understanding the healthcare providers' perspectives will help determine which

EMR initiatives promote opportunities for and which are the barriers towards EMR adoption. The findings will be useful for decision makers attempting successful EMR adoption, enable health service policy makers with information as they try to increase adoption rates, funding agencies and stakeholders to more effectively scale-up the use of EMR in Kisumu County. In this research paper, the term “facilitator” is defined as activities or initiatives that are undertaken by health facilities to promote usage of EMR and “barriers” is defined as personal or health facility constraints mitigating the effective and efficient use of EMR.

#### **1.4 Research Question**

This study was guided by the following research question:

What factors influence healthcare providers to adopt EMR in HIV Clinics in Kisumu County?

#### **1.5 Objective**

##### **Broad Objective**

The broad objective of this study was to describe factors that influence healthcare providers’ use of EMRs in HIV clinics in Kisumu County.

##### **Specific Objectives**

The study was guided by the following specific objectives:

- i. To describe facilitators to the use of EMR by healthcare providers working in HIV clinics in Kisumu County.
- ii. To explore barriers to the use of EMR by healthcare providers working

in HIV clinics in Kisumu County.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

This chapter reviews literature that is in alignment to the study. The focus is to review EMR in developed countries, developing countries and the themes identified by other researchers which have facilitated or acted as barriers to EMR use in the different health facilities.

### **2.2 Electronic Medical Records**

Historically, when a patient visits a health facility, data will be captured using paper. There are several challenges with using paper as a means to seeing patients. Paper records can be easily lost, misplaced, or are often illegible. In order to reduce medical errors, provide more effective methods of communicating and sharing information among clinicians, and better manage patient medical records, information technology should be embraced in healthcare (Ajami & Bagheri-Tadi, 2013a).

The National Alliance for Health Information Technology defines Electronic Medical Record (EMR) as the electronic record of health-related information on an individual that is created, gathered, managed, and consulted by licensed clinicians and staff from a single organization who are involved in the individual's health and care (Gyamfi et al., 2017). The purpose of EMR is to be used by healthcare providers from registration when patient walks into the facility to the pharmacist when existing. This in turn would help in improving record keeping and patient

care.

### **2.3 Adoption of Electronic Medical Records in Developed Countries**

The healthcare industry is one of the largest growing industries and the digitization process was introduced to the European countries over 10 years ago and has shown amazing results (Bonomi, 2016). Countries such as the United States (U.S), United Kingdom (UK), European Union and Australia have advanced healthcare infrastructures that receive substantial funding and support from their governments (Sood et al., 2008). In the U.S, EMR has continued to be grow steadily and widely acceptable, for instance, from 2015, 87% office-based physicians had adopted the use of EMR, from 42% in the previous years (Yang & Jamoom, 2016).

In the European continent, each country has taken its own distinct approach to implement EMR and its technologies. Denmark leads the way in European eHealth and patient- controlled health records (Cruickshank et al., 2012). The success of the eHealth system could be attributed to decentralization and multi-level architecture taken up the government (Bonomi, 2016). According to the Bloomberg in 2013, the UK has one of the highest EMR adoption rates (97%), which is just behind Norway (98%) and The Netherlands (98%) (Robertson, 2013). What influences the European countries to uptake EMR is perceived benefits, barriers and impacts, institutional settings, organizational settings, design and availability of applications among others. However, the success has not come without challenges. France is developing the concept of digital hospitals via telemedicine technologies (Nzuki & Mugo, 2014). Germany is working on an Electronic Health Card (EHC)



which will allow the physicians to check the administrative data of the patient and to write prescriptions on EHC. The EHC will also have voluntary medical functions like the emergency data record and later an electronic patient record that can be checked anywhere using appropriate card readers.

In the (U.S.), \$1.2 billion grant was sanctioned to expedite the adoption of EHRs in all hospitals by 2014 (Nzuki & Mugo, 2014). With the adoption of EMR's, patient data will be captured electronically benefiting all promises EMR hold to address. A survey was published on the HIMSS website (2015) that only 3.4% of the hospitals are completely paperless whereas nearly 4.4% of the hospitals are still using PBMR. A study on the levels of EHR adoption in USA revealed that only few US hospitals had a comprehensive electronic clinical information system and many others only had parts of an electronic records system. It was established that financial support, interoperability and training of information technology support staff by policy makers is necessary for increasing the application of EHR in US hospitals (Aminpour et al., 2014). The adoption of EMR accelerated when the Health Information Technology for Economic and Clinical Health Act was enacted in the year 2009. The act offers significant financial incentives for hospitals and doctors' surgeries. The rate of EHR adoption among providers has increased significantly in recent years and more than three-quarters of US hospitals have at least a basic EMR system (Adler-Milstein et al., 2015).

In Australia as the pioneer of EMRs, Health Information Technology (HIT) is considered the basis for improving the quality of healthcare, safety and efficiency by the government. In the late 1990's most general practices were encouraged to install clinical software packages for prescribing and transmission of clinical data

(McInnes et al., 2006). Health Connect was a joint Australian, State and Territory Governments' initiative for revolving paper-based health records to EMRs for the benefit of consumers and also health-care providers. As a result, health information would be more quickly available and transferred among healthcare professionals under more secure condition. The main aims of this program were to improve the accessibility of life-saving information in emergencies and also the improvement of safety and quality of health information through a shared electronic health record (Aminpour et al., 2014). The responsibility of developing a design for shared electronic health record was given to The National E-Health Transition Authority.

#### **2.4 Adoption Electronic Medical Records in Developing Countries in Africa**

Developing countries have realized that they need to embrace EMR if they are to solve problems with quality of data, access and safety of patients in healthcare. There is a good deal of research in EMR in advanced countries like the UK, USA and Canada and few papers cover developing countries (Williams & Boren, 2008). The developed countries are able to make significant investments in research to develop information systems that would meet the need of their particular healthcare system. This is in sharp contrast to the healthcare infrastructure of many developing countries, whose success in healthcare systems is expected to satisfy several stakeholders. Most importantly, systems must serve the patients, clinicians, researchers, funding agents (Tierney et al., 2010) and the associated Ministry of Health. In Africa, countries like Malawi, Ghana, Rwanda, Tanzania, Uganda, Mozambique, Lesotho and Kenya have implemented EMR in management of HIV/AIDS (Mhembere, 2019).

In Rwanda, Partners in Health (PIH) implemented an EMR system to help support and improve HIV and TB patients' care. An automated data quality improvement system reduced the known medical errors by 92% and by 2008, the Health industry started appreciating and recognizing the importance of Electronic health records (C.L. et al., 2010). In Rwanda EMR has been introduced to many public health facilities and it supports different aspects of care including: patient admissions, medical records and medication administration, which supports for patient monitoring (Uwambaye et al., 2017).

Malawi has a rapidly increasing population density and Baobab Health Trust, a Malawi- based nongovernmental organization, partnered with the Ministry of Health to support, monitor and evaluate antiretroviral therapy (ART) using EMR (Landis-Lewis et al., 2015b). The EMR was endorsed by the Ministry of Health for national scale- up in high-burden ART clinics, defined as clinics having more than 2000 patients on treatment. However, some healthcare workers prefer to see patients using paper records (Mhembere, 2019). EMR system efficiently and accurately guides healthcare providers through the diagnosis and treatment of patients following national treatment protocols. The system also captures timely and accurate data that is used by healthcare providers during patient visits to supplement decision making. Challenges that have been cited to the use of EMR include lack of training of the HCP, poor existing infrastructure and unstable electricity (Tough & Lihoma, 2018).

EMR technology in Uganda is gaining ground in public hospitals with software such as Careware being widely used (Mhembere, 2019). Apart from Careware,

other EMR systems in use include OpenMRS and District Health Information Systems 2(DHIS2) (Kiberu et al., 2017). As cited by Kiberu 2017, implementation and adoption of the EMR have been with challenges such as shortage of skilled workers, limited funding and challenges in converting previous paper records into electronic.

In Kenya, EMR has been deployed and it provides patient registration and patient visit records management with capability to handle information. However, the penetration of EMRs particularly in public health facilities has been low (Wamae, 2015). There is a number of EMR systems that exist such as AMPATH Medical Record System (AMRS) which is implemented at primary care health facilities in different parts of Kenya including, Eldoret Kenya and Kisumu (Rachlis et al., 2015). Open Medical Record System (OpenMRS) is another variety of EMR that is mostly deployed in public health facilities Kisumu county as well as Kenya Electronic Medical Record System (KenyaEMR). The varieties of EMR in our country indicates the significant progress that is being made in the EMR technology (Mhembere, 2019). A lot of investment has been made in the HIV clinics to ensure EMR is implemented in public health facilities but little is known about adoption of EMR in HIV clinics in the public sector. Most of the HIV clinics have deployed EMR systems but use of the EMR in health facilities is still not at the standard expected. This study is set to ask the key people, who are the providers, for their views and experiences in regards to the factors that have led to their use of the EMR. For the facilities whose EMR have been deployed and not adopted, what challenges they are facing. This will form a basis to highlight challenges and be able to iron them out and reinforce the positives.

## **2.5 Benefits of Electronic Medical Records**

Primary healthcare involves the one-on-one interaction between a patient and health care provider. With the introduction of EMR in health facilities, there are expected benefits to the government in terms of reporting, benefits to facility in terms of cost savings, benefits for patients in term improved service delivery and patient care, and to the users (health care workers).

### **Timely Access to Medical Records**

Patient's information is vital to have when needed, as it greatly improves healthcare providers in making informed clinical decisions (Salleh et al., 2021). EMR provides this timely availability of information since the data is electronically collected. The risk of losing files and thus loss of patient information is greatly reduced using EMR.

### **Improved Patient Safety**

Patient safety is defined as the prevention of adverse effects and errors associated with patient healthcare management. In the context of EMR, patient safety is achieved largely through alerts, reminders, and other components of Computer Physician Order Entry (CPOE). CPOE makes information available to physicians at the time they enter an order— for example, warnings about potential interactions with a patient's other drugs (Tubaishat, 2019).

### **Improved Quality of Care**

One of the main benefits reported of EMR is the increased quality of care resulting

from patients having their essential health data accessible to their different healthcare providers. One of the ways in which patients benefits from quality of care is through proper documentation associated with EMR's (Karp et al., 2019). This availability of data can significantly improve the coordination of care (Gagnon et al., 2014).

## **2.6 Facilitators to Electronic Medical Records Use**

There are known facilitators that have made healthcare providers use EMR for their daily activities. Some of these are: -

### **Management Support**

For most systems to thrive, management has to support the initiative. Getting the management to support the process is crucial and a big positive to system adoption (Berihun et al., 2020a). Systems often fail because they support the values of management, not the values of staff and users. Management can support the users of the system in various ways such as training, provision of computer resources and motivating the staff.

### **Availability of Resources**

Facilitating conditions such as adequate resources was found out to be amongst the strongest contributor to EMR use by (Chisolm et al., 2010). In this study resources equate to any computerized gadget that enables healthcare providers to capture patient's data using the EMR. The resources include tablets, laptops, desktops, UPS, keyboards mouse and monitors.

### **Technical Support**

Technical support is needed to install and operate the EMR. Technical support is needed to facilitate the use of EMR both in the initial days of EMR implementation and weeks afterward (Influence of Digitization of Medical Records, 2018). Having IT personnel to work round the clock to handle IT problems and emergencies is seen as a facilitator to EMR adoption (Gyamfi et al., 2017). When such technical assistance is assured in the use of EMR, it boosts HCP confidence to start using the EMR as they are aware help is readily available as (Al-Rawajfah & Tubaishat, 2019) suggests.

### **Informal Support from Colleagues**

Many physicians from a study conducted by (Najaftorkaman & Research Online, n.d.) reported, they were better able to use EMR from talking to and observing other colleagues using EMR. Physicians borrowed tips and strategies from colleagues and also asked colleagues for specific help when stuck such as troubleshooting, writing orders and writing clinical notes. Colleague support is vital in motivating fellow users to continue using EMR deployed.

### **Adequate Internet Bandwidth**

From a study that was conducted by (Influence of Digitization of Medical Records, 2018), adequate Internet bandwidth was notable facilitator to EMR adoption. Internet bandwidth enables healthcare providers be able to access the EMR in instances where the server does not reside in the same location as the users.

### **Capacity Building and Training**

EMR training instills confidence in the usage of the EMRs among users. As such it

is utmost important to identify the training need of the staff and the resources required for efficiency. During implementation, training of the EMR users is perceived as a great facilitator to EMR adoption and enhances ease of using the system (Gyamfi et al., 2017). Training can take many forms such as workshops, OJT and classrooms.

### **Perceived Benefits of Electronic Medical Records**

In developing countries, patients information in most of the hospitals is recorded using papers (Hossain et al., 2019). The drawbacks to paper-based are not limited to but include, incomplete data, data disintegration, data inaccuracy and incomplete data (Tun, 2017).

Such drawback hinders the continuity and excellence of patient care. EMR has been considered as one of the solutions to such problems. The potential benefits EMR promises such as data accuracy, timely reporting, easy retrieval of data and improve quality of patient care by taking proper decision for treatment has been a great facilitator to encourage its use.

### **2.7 Barriers to Electronic Medical Records Use**

To better understand the reason behind EMR not being used in primary health facilities despite them being available, one must consider healthcare providers' perspective. Physician's barriers to adopting EMR as follows: User attributes, System attributes, Organization support, and Environmental factors.

#### **User Attributes**

These are individual characteristics that might impede the use of EMR's.



### **Absence of Computer Skills**

To use EMR, one needs to have some basic computer skills to navigate. Some primary health facility workers do not have the required skill set, like good typing skills to be able to capture medical information, relevant notes and prescriptions (Tierney et al., 2016). Most of the healthcare providers in Tanzania are nurses and midwives, and these groups form 80 percent of overall healthcare providers. Unfortunately, these workers lack computer skills as well as general skills for the use of E-healthcare information systems (Furusa et al., 2018).

### **Understanding the Electronic Medical Records System**

When healthcare providers do not have a clear understanding of the EMR system then it becomes a great hinderance for them to use it. For instance, navigation through the system and being unfamiliar with specific functions like remote access is considered barriers that hinder the use of EMR. Healthcare providers who do not have a knowledge and understanding of the EMR are more likely to resist as compared to those who understand the EMR (Awol et al., 2020).

### **Inadequate Training and Technical Support**

Healthcare care workers are not technical experts, so there is need for appropriate technical support and training in order to adopt EMR. It is known that healthcare providers are not technical experts so when they do not receive proper training, they will not use the EMR system (Berihun et al., 2020b). Some of the problems associated with inadequate training include; EMR usability, especially for documenting progress notes, this makes clinicians to spend extra work time to learn effective ways to use the EMR and this inclines HCP towards paper-based

documentation.

### **System Attributes**

This refers to the EMR system, software and hardware supporting it. Some of the barriers related to this aspect are:

#### **Supporting Hardware**

Implementing EMR systems requires considerable hardware, including computers, cable and Internet connections (Yehualashet et al., 2021). Therefore, the successful implementation of EMR by healthcare organizations should take into account the allocation of appropriate technical resources and a percentage of total revenue (Yehualashet et al., 2021).

#### **Computer speed**

Computers are seemed to be slow when healthcare providers access them. The slowness of the computer was perceived as a barrier to use (Muinga et al., 2018). Speed is also accredited to how fast services are accessed in a shared computer.

#### **Computer usability**

It is described the system ability to be easily used, mainly because of the system's consistent format. When the EMR's lack intuitiveness, overly structured notes, fragmented information, and cumbersome, healthcare providers avoid to use it (Yoo et al., 2022)

#### **Organizational Support**

These are barriers that are related to organizational factors such as management and

compensation.

### **Time**

Health facilities usually have paper records in their daily operation in seeing patients. With the introduction of EMR, it means transferring the paper records to electronic which is considered time consuming. When using EMR, a clinician's workflow is affected thus clinicians sighted more additional time was required to learn how to use the EMR (Tierney et al., 2016) and capture patient data into the system. Clinicians claim that capturing patient data using paper records is faster as compared to using the system thus spending more time with a patient.

### **Integration of Services**

In a health facility, they are various disparate health systems which should be integrated to ensure efficiencies and acceptance and use of the system (Wang, 2019). In health facilities where some services are offered using paper and others using EMR, it proves difficult for healthcare providers who have no access to EMR to access any information when seeing patients who records are in the EMR. This in turn makes the healthcare providers go back and rely on printed paper documents.

### **Environmental Factors**

These are barriers that are related to physical or social work environment

#### **Physical Space**

Space is always a challenge in health facilities. The room which the HCP see patients are cluttered, and do not have sufficient space to accommodate the

computer equipment. The fact that computer station is stationed at a particular location and not mobile is proving to be a challenge (Ajami & Bagheri-Tadi, 2013b) and at times they are placed inconveniently close to the patients. The introduction of portable devices in health facilities will help in solving such challenges.

### **Electricity**

Power is essential hardware for computers to work efficiently. African countries find it difficult to provide stable power or Uninterrupted Power Supply for the ICT provision in the health facilities consequently this hinders EMR use (Jawhari, Ludwick, et al., 2016). Lack of or unstable erratic supply of power does not only affect the well-functioning of the EMR in the health facilities but can also damage the hardware.

### **Connectivity**

EMR requires connectivity for effective use in a health facility. Connectivity can either be wireless or wired to ensure all clinical points are connected. The reality is, connectivity is not always available and if available the connectivity is very intermittent. Although the access to the Internet is improving in many parts of Africa (Oyeyemi & Wynn, 2014), the problem of Internet connectivity and Internet services is still a major challenge in many developing countries like Kenya. A study was conducted in Kenya which focused on establishing infrastructural barriers to eHealth implementation in developing countries which indicated the for adoption to be successful connectivity is key (“Infrastructural Barriers to E-Health Implementation in Developing Countries,” 2013).

### **Clinical Workflow**

Clinical workflow is a description of how a patient moves in a healthcare facility. Clinical workflow can impact changes in healthcare delivery to patients. Adoption of EMR in the healthcare facilities can bring changes of how care is delivered to patients. When the EMR interrupts the clinical workflow, healthcare providers become resistant to use the EMR (Hossain et al., 2019; Ferraz & Guedes, 2017).

### **Workload**

Workload arises when the healthcare worker enters data both on paper and in the EMR system. Health care providers feel like its double work having to do both manual and electronic recording (Janssen et al., 2021).When presented with such choices, they automatically default into using manual as it is familiar to them.

### **Staff Rotation**

Staff rotation refers to transfers of healthcare providers from one facility to another. As much as there are benefits associated with staff rotation such as reduce job burnouts and reduced strain on employees (Santos et al., 2016). However, staff rotation has a negative effect on EMR user training, when training is not frequent enough and staff is rotated, the adoption of EMR in such facilities is lowered (Landis-Lewis et al., 2015a).

## 2.8 Conceptual Framework

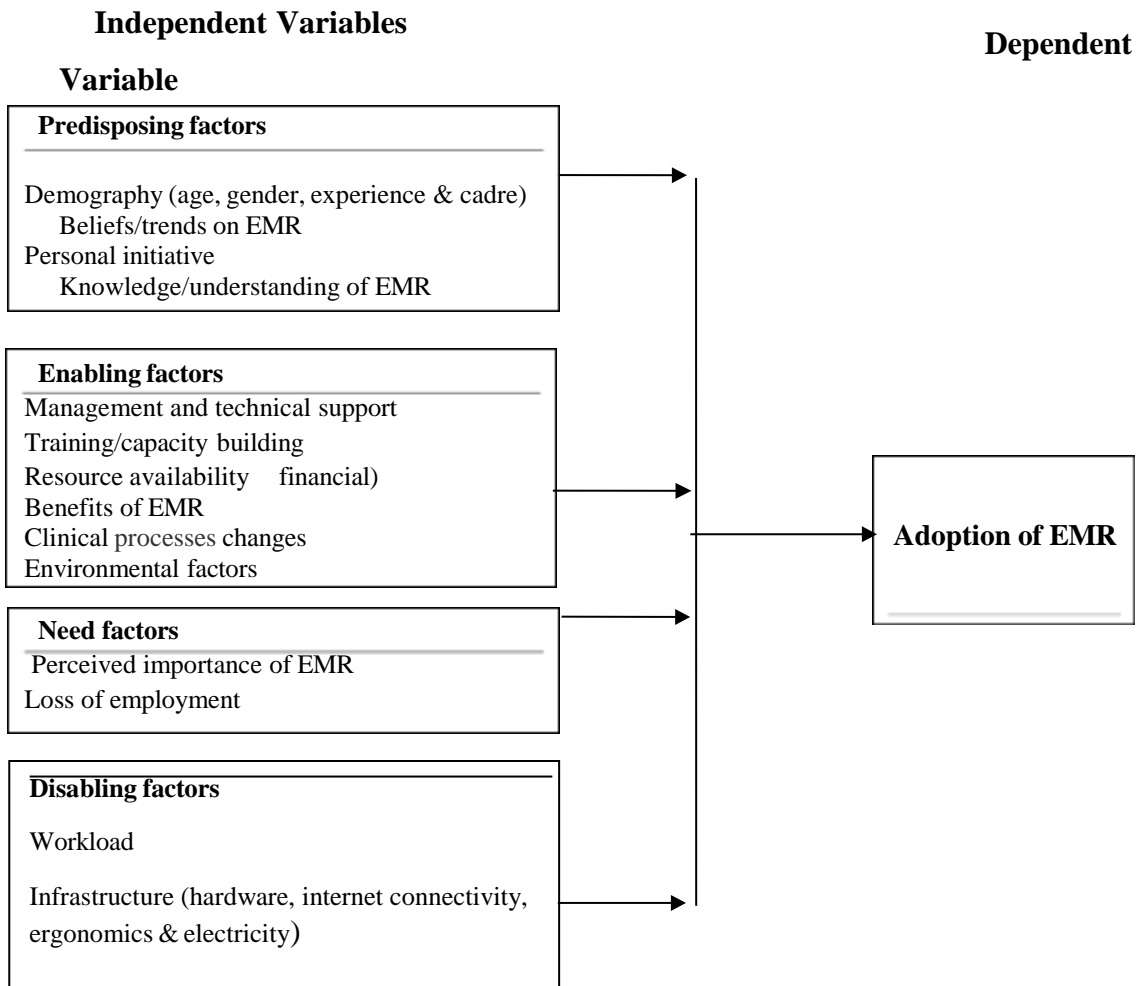
There are several models such as Technology Acceptance Model (TAM) that evaluate the factors that cause end users to embrace or reject information technology. This model is particularly applicable in the health information technology field because it focuses on use and these variables affect users to come and accept and use a technology. It is mostly used in quantitative research.

However, this study adopted Andersen and Newman (2005) framework of health service utilization which is commonly used in the healthcare, and it demonstrates the factors that lead to the use of health services (Factors & Beliefs, 2013).

In this study, the health service utilization model predicts that a series of factors; predisposing, enabling/disabling and need factors influence how healthcare workers in Kisumu HIV clinics utilize the EMR. The factors that have been identified from the study are then grouped into facilitators and barriers which then determined the use of EMR. The dependent variable is the adoption or use of EMR.

The independent variables are facilitators and barriers to adoption of EMR. Facilitators to adoption of EMR have been grouped into pre-disposing factors, enabling factors and need factors. The predisposing factors refers to the inclination to use the EMR and can be determined by individual characteristics. This study focused on age, gender, employment cadre, beliefs/trends on EMR and personal initiative as predisposing factors. Enabling factors refers to the variables that makes EMR available to an individual and may come from the facility, management or community. This study focused on management support, technical support and training, perceived benefits of Electronic Medical records as enabling factors to use

of EMR. On the contrast, disabling factors are those that impede EMR use and were therefore considered as the barriers to adoption of EMR. The study focused on workload, connectivity, electricity, integration of services and supporting hardware as the main possible barriers to be assessed. Need factors are the most immediate cause of EMR use, from problems that generate the need for the EMR adoption. This study focused on perceived importance of EMR and loss of employment as a need factor. This is illustrated in figure 1.1.



*Figure 1: Conceptual Framework based on Andersen and Newman (2005)*



## **CHAPTER THREE: METHODOLOGY**

### **3.1 Introduction**

This chapter described the methodology that was used to conduct the study. It included project's research design, target population, sample size and sampling procedure and techniques, data collection instruments, data collection procedures, data analysis techniques and ethical considerations.

### **3.2 Study Design**

This study used a qualitative design. This design was selected as it contributes to deeper understanding of the experiences by exposing taken-for granted assumptions. The approach used for data collection is through in- depth interviews with nurses and clinical officers.

### **3.3 Study Setting**

The study was conducted in Kisumu County. The county has both urban and rural health facilities, with rich ethnic and cultural diversity. The Population and Housing Census (2019) estimated Kisumu County's total population at 1,155,574 persons with 556,942 male, 594,609 female and 23 intersex (Republic of Kenya, 2019). It has 7 sub-counties, namely Kisumu East, Kisumu West, Kisumu Central, Seme, Nyando, Muhoroni and Nyakach. It is estimated to have a HIV prevalence rate of 19.3%, and has been categorized among the 9 counties that account for 65% of new HIV infections in the country (International, 2017).

HIV continues to contribute to high mortality rates, burdening households and straining the national health systems. In Kisumu County, most HIV programs are donor dependent and the County works closely with the implementing partners to deliver services to patients. Non-governmental organizations often support outpatient HIV services within the public health facilities. In these HIV clinics, the healthcare providers have been trained to provide care to the patients.

### **3.4 Study Population**

This study targeted healthcare providers (HCP) working at the HIV clinics in the public health facilities in Kisumu County. The study specifically targeted clinical officers and nurses who use the EMR. The reason for the target cadres is because they are privy to information that influences the decision for EMR adoption.

### **3.5 Eligibility Criteria**

#### **Inclusion Criteria**

- The healthcare provider working at a public primary and secondary care health facility, faith-based facility or an NGO-based health facility with a HIV clinic.
- The healthcare provider working at a health facility that has submitted their EMR data to the Kenya Health Management Information System (KeHMIS) portal.
- The healthcare provider has worked in that facility for over 6 months.
- The healthcare provider has used the EMR at the facility.

#### Exclusion Criteria

- The HCP is working at a private practice.

### **3.6 Sampling Technique**

This study used purposive sampling to identify the study participants. The study made use of liaison personnel in the sub counties who were familiar with the study participants to help in identification. The liaison personnel involved in identifying the study participants were mostly information communications technology (ICT) officers and staff in charge of the health facilities. National Aids and STI Control Program have a website where all health facilities that have EMR can upload their data to the data warehouse. This data warehouse is accessible through the address <http://data.kenyahmis.org:4700/>. The health facilities used in this study was taken on November 7, 2019 at 11:53am selecting Kisumu as our target county. There are 58 health facilities that had uploaded data to the data warehouse. Of the 58 health facilities, 54 met the set inclusion criteria.

The study made use of stratified random sampling to select a health facility in each level of care in a sub-county. Kisumu Central has health facilities from each level of care; from level 2 to level 5, this totals to 5 health facilities being selected in this strata. Kisumu East, Muhoroni, Nyakach and Nyando have health facilities from each level starting from level 2 to level 4, selecting 1 health facility in each level from the 4 sub-counties totaled to 12 health facilities. Seme and Kisumu West sub counties which has 2 level of care health facilities totaling to 4 . This brings to a total of 18 health facilities included in the study. If in that level of care there exists only one health facility, then the health facility was automatically selected. Table

3.1 below shows the distribution of health facilities in each level of care category that were engaged in this study.

*Table 3.1: Distribution of healthcare facilities per Subcounty*

<b>Sub County</b>	<b>Number of facilities</b>	<b>Level of care</b>	<b>No. of facilities sampled</b>
<b>Kisumu Central</b>	<b>15</b>	L2	1
		L3	1
		L4	1
		L5	1
<b>Kisumu East</b>	<b>7</b>	L2	1
		L3	1
		L4	1
<b>Kisumu West</b>	<b>7</b>	L2	1
		L3	0
		L4	1
<b>Seme</b>	<b>3</b>	L2	0
		L3	0
		L4	1
<b>Muhoroni</b>	<b>7</b>	L2	0
		L3	1
		L4	1
<b>Nyakach</b>	<b>10</b>	L2	1
		L3	1
		L4	1
<b>Nyando</b>	<b>5</b>	L2	1
		L3	1
		L4	1
		<b>Total</b>	<b>18</b>

### **3.7 Sample Size**

There were 42 study participants who were purposively sampled from the health facilities selected. The 42 study participants comprised of nurses and clinical officers as represented in the table 3.2 below:

*Table 3.2: Number of healthcare provider interviewed.*

<b>Sub-county</b>	<b>Health care provider interviewed</b>	<b>Nurse</b>	<b>Clinical Officers</b>
Kisumu Central	13	3	10
Kisumu East	4	1	3
Kisumu West	5	2	3
Seme	4	3	1
Muhoroni	5	2	3
Nyakach	4	2	2
Nyando	7	2	5
<b>Total</b>	<b>42</b>	<b>15</b>	<b>27</b>

### **3.8 Study Tool and Variables**

This study made use of in-depth interviews. In depth interview was the preferred choice as it provided detailed information about a person's thoughts and behaviors. Moreover, one could also probe for additional information and the method provided an opportunity to ask follow up questions. Demographic data collected included:

1. Facility level
2. Gender
3. Level of education
4. Cadre
5. Number of years in service

The interview guide was divided into 2 sections and covered the following areas:

1. Factors that have made HCP use the EMR- facilitators
2. Factors that have made HCP not use the EMR - barriers.

### **3.9 Data Collection**

Before the data collection process started, this study liaised with ICT personnel and facility in charges from the sub-counties. The two cadres were focal point persons in the health facilities who helped in identification and recruitment of the study participants. Once the participants had been identified, the staff in charge of the health facility was made aware of the research before any interviews were done. The potential study participants identified were contacted using their mobile phone numbers prior to the data collection date. The phone conversation informed the study participants of the research and established their willingness to participate.

Once the research participant showed willingness, the interviewer scheduled an appropriate time and date from the given date ranges for face-to-face in-depth interviews. The preferred venue of the in-depth interviews was at the health facility where the study participants worked. However, phone interviews were adopted for participants who were not available at the facility.

The data was collected in English which is well understood by all the expected participants. The study had 2 research assistants who had experience in qualitative data collection process. The research assistant's selected were a referral from a well-known researcher and had previously done qualitative data collection. A two-day training session and orientation of the study was conducted to the research assistants prior to the data collection period.

Before the interview sessions started, the interviewer explained to the study participants what the consent form entailed. The consent form was read to the

interviewer (Appendix II). The study participants were made aware that their responses would remain anonymous. Once understood and willing to participate in the study, the study participant's consent was captured at the start of the interview. During the interview session, data was captured through audio recording and field notes. Each interview session lasted for 15- 25 minutes.

### **3.10 Data Management and Analysis**

After data collection, the recorded interviews were transcribed into a word document. Descriptive statistics was used to summarize socio-demographics data. After transcription, content analysis of the data was performed using both deductive (a priori) and inductive (emerging) codes using Dedoose software package. Deductive codes arose from prior literature review while inductive codes were the additional codes that we got from the review and interpretation of the in-depth interview sessions. The study followed the steps described by (Naanyu et al., 2020) about becoming familiar with data, generating initial codes across the data set and grouping coded data, searching for themes by gathering data that were relevant to each theme, reviewing themes, defining and naming themes identified, and producing an analysis report and selecting appropriate, vivid quotes in support of described themes.

### **3.11 Data Storage**

All recorded data was copied to the principal researcher's laptop for safe keeping. The field notes that were taken during interviews are safely stored by the principal

researcher.

### **3.12 Limitation of the study**

This study faced some limitations. During data collection period, we had to get additional approvals to collect data in some targeted HIV clinics. As a result, this caused delayed in data collection. Secondly, some participants who were eligible to participate in the study were scared to be audio recorded thus their perspective not captured. Moreover, the study was limited to one county due to limitations of geographical accessibility and time during data collection in this time of the pandemic. For a wider coverage of data, time and more researchers are required for data collection. There are different varieties of EMR in use at the different health facilities, thus the participants comments should be attributed to the system and cannot be generalizable to all EMR systems.

### **3.13 Ethical Consideration**

Ethical review and approval were sought from Moi University School of Medicine Institutional Research and Ethics Committee, NACOSTI, Kisumu County, Public Health Department and Jaramogi Oginga Odinga Teaching and Referral Hospital. All the participants in the study were informed prior to the interview and participation was voluntarily. Informed consent was obtained verbally and recorded before the interview started. Confidentiality and anonymity were assured during report/paper writing, presentation and publication.



## **CHAPTER FOUR: RESULTS**

### **4.1. Introduction**

This chapter presents the study results based on thematic and sub thematic areas as per the study objectives. The study was guided by the following specific objectives:

- i. To describe facilitators to the use of EMR by healthcare providers working in HIV clinics in Kisumu County.
- ii. To explore barriers to the use of EMR by healthcare providers working in HIV clinics in Kisumu County.

The results are explained in the subsequent sub-sections.

### **4.2 Characteristics of the Participants**

The study interviewed a total of 42 participants across 18 health facilities. More than half of the respondents were male (52.4%), with 64.3% being clinical officers and 35.7% being nurses. The medium age was 35 with 83.5%, being under the age of 40. Of the respondents, (71.4%) had at least 10 years of professional and (21.4%) had at least 20 years 'experience. The implication of this finding is that the difference in number between female and male respondents was not huge; therefore, the study was not biased in terms of gender parity. In addition, majority of the respondents were below age of 40; and were thus young, vibrant and active and could easily embrace technology such as EMR in the healthcare provision. Finally, respondents from this interview had at least a 10-year experience, which is adequate time in healthcare provision implying that the group interviewed was able to give relevant information on facilitators and barriers to EMR adoption. The

demographic of participants who participated in this study are shown in Table 4.1.

*Table 4.1: Participants characteristics*

<b>Variables</b>	<b>N (%)</b>
<b>Age (in years)</b>	
25 -32	17 (40.5)
33 - 40	18 (42.9)
41 – 48	5(11.9)
49 - 56	2 (4.8)
<b>Gender</b>	
Male	22 (52.4)
Female	20 (47.6)
<b>Cadre</b>	
Clinical Officer	27 (64.3)
Nurse	15 (35.7)
<b>Level of Education</b>	
Diploma in Clinical Medicine and Surgery	25 (59.5)
Degree in Nursing	2 (4.8)
Diploma in Nursing	12 (28.6)
Degree In Clinical Medicine and Surgery	1 (2.4)
Degree in Sociology	1 (2.4)
Registered Nurse	1(2.4)
<b>Experience (in years)</b>	
1-10	30 (71.4)
11-20	9 (21.4)
21-30	3 (7.2)

#### **4.3 Facilitators to the use of EMR by healthcare providers working in HIV clinics in Kisumu County, Kenya.**

This study sought to describe facilitators to the use of EMR by healthcare providers working in HIV clinics in Kisumu County. Facilitators to the use of EMR were organized into three main categories which are pre-disposing characteristics of individuals prior to use of EMR, enabling resources and the need factors. The study

identified three pre-disposing factors and twenty enabling factors to EMR use. The subcategories were organized and merged to 9 themes as shown in Table 4.2 below. The table below shows facilitators to the use of EMR by healthcare providers working in HIV clinics in Kisumu County which include personal initiative, beliefs/trends of EMR, knowledge/understanding of EMR, ease of EMR Operation, benefits of EMR, human resources, technical support, environmental factors, management support, training/capacity building and resource availability.

*Table 4.2: Facilitators to Electronic Medical Records Adoption*

<b>Predisposing characteristics</b>	<b>Themes</b>
Personal initiative	Personal initiative
Beliefs/Trends of EMR	Beliefs/Trends of EMR
Knowledge/understanding of EMR	Knowledge of EMR
<b>Facilitators</b>	<b>Themes generated</b>
Solar Provision	Management support
Backup Power	
Management support	
Presence of Human resource information officers	Data personnel
Capacity building initiatives	Capacity building initiatives
Tracking of clients	Clinical changes in healthcare delivery
Workflow	
Clinical Process	
Informal support from colleagues	EMR Support
Technical support	Ease of EMR Operation
Usability of EMR	
Changes in Delivery	EMR Attribute
Data preservation	
Ease of work	
Retrieval of data	
Reminder /appointment	
Reporting	
Resource availability	
<b>Need factors</b>	
Missing patient data	
Loss of employment	
Reporting	

### 4.3.1 Predisposing Characteristics

Predisposing characteristics consisted of factors related to demographic, social structure, knowledge, attitudes and beliefs that have enhanced the healthcare provider to use EMR in their health facilities.

#### Positive Attitude of the Healthcare Provider

Personal initiative was often mentioned as a necessary and inevitable condition for efficient use of EMR. More than half of healthcare providers believed that having a positive attitude towards EMR with lots of personal initiatives required time, repetition and effort to become better. Two respondents had this to say:

*“I believe this is self-initiative, for the fact that I have been having the interest of using it.”* **Clinical officer 3, L4, Kisumu Central**

*“Another thing is that we should have positive attitude from ourselves. We must have that positive attitude towards the use of EMR because you might find that the machines are there but if you don't have that positive attitude, you might not fully embrace that EMR.”* **Clinical officer 1, L4, Nyakach**

#### Belief/Trends about Electronic Medical Records

In most of the healthcare facilities, clinical officers had the most interaction with the EMR than nurses. Healthcare providers interviewed were aware about technological trends and the impact it has on the medical aspect. As a result of this knowledge, it had catapulted them to adopt the EMR. Some respondent had this to say.

*“It was something that was rolled out from (facility name). It was a little bit*

*technical to introduce it because of the paper and the registers we were used to. But we wanted to try to see if it can blend well with both paper and EMR. I can say that technology is the one that is taking us there” Nurse 4, L4, Kisumu West.*

*“Things are going digital and we need a central system where patient information can be captured electronically, where we do away with filling and all that kind of staff. The system is actually going digital. NASCOP are saying everything we do will be digital” Nurse 4, L5, Kisumu Central.*

The HCP also believed EMR has made their work easier as one interviewed said:

*“We are embracing EMR because we like it. It has improved our work.” Nurse 2, L4, Seme*

### **Knowledge/Understanding of Electronic Medical Records**

The healthcare providers who had sufficient knowledge and understanding of the benefits the EMR has as compared to paper, made them use it in their daily operations. The benefits mentioned by one of the respondents was:

*“EMR was helping us to see patients quickly as compared to the paper work. It is very efficient and then we were able to capture all clients. But for the files, you can see some files which are remaining behind, the data persons cannot enter all the files. But if we see clients using the EMR at the clinical area, it ensures all clients are logged in. And then another thing, it automatically informs us when a client is due for VL [Viral Load], when a patient is supposed to be given an INH, I mean” Clinical Officer 1, L2, Kisumu Central.*

The healthcare providers awareness of how easy it is to use EMR facilitated the adoption as stated below.

*“It also helps in reporting which makes it very easy compared to when you are now going to the register which is quite hectic.” Clinical Officer 1,L4, Kisumu Central*

#### **4.3.2 Management Support**

The participants mentioned that the management support is a contributor to them using EMR. Management can offer support in many ways such as orientation of staff to use EMR. Some of the healthcare workers were happy that management offered orientation to the staff before they started to use EMR.

*“For all new staffs that can use EMR, they are given a brief orientation on the EMR’s. At least the staffs are trained somehow on the use of EMR, so they have an idea how to use. For new staff, are usually given some sort of orientation on EMR. This forms a basis from where a staff can start from and not from zero” Clinical officer 1, L2, Kisumu West.*

**Solar provision/Generator;** electricity is a major problem in the health facilities where EMR is installed. In some health facilities, the management has provided an alternative source of power like solar panels and generators to ensure continuity in case of electricity interruptions which are frequent. This in turn motivated the healthcare workers to continuously use the EMR.

*“The management supports the EMR use by providing space for instalments of solar systems, especially connected to the computers where the EMR is currently being implemented. Whenever there are blackouts, they always put fuel on the*

*generator though occasionally.” Clinical Officer,2, L4, Nyando.*

*“We have a backup so when power is not there, we always continue to use EMR. We will not stop that “stima imepotea” (No Power)” Clinical officer 1, L3, Kisumu Central*

*“But we thank God just 2 months ago, the program was able to install for us the solar panels. That is a backup power source. So that one has been solved.” Clinical officer 1, L3, Nyando.*

**Computer provision;** managerial support by allocation of computer n health facilities when available is a great facilitator to use of EMR as stated by the respondents below

*“Yes, we were given resources, you realize that I just forgot my tablet (A bang at the door) that tablet is part of the resources the management system gave us so that rather than using your own gadget. That tablet is specifically for that.” Nurse 2, L4, Kisumu West.*

#### **4.3.3 Presence of Health Record Information Officers.**

The presence of HRIO’s has a played a big factor to the healthcare workers to adopt the EMR. Since they help in entering some data in instances when electricity or connectivity fails, or the workload is a lot and they have not captured all patients.

*“We have competent data clerk and also health record system officers who are able to key in and pull information correctly.” Clinical officer 1, L4, Muhoroni*

*“HRIT’s help us to do some mentorship, and also hiring of the data clerks who are well conversant with the entries.” Clinical officer 2, L3, Nyando*

*“I think by bringing the HRIO that is one of the ways and then continuous support on the use of EMR” Clinical officer 1, L3 Nyakach*

### **4.3.3 Capacity Building and Training**

The provision of adequate training, including continued refresher training for healthcare providers, is a key strategy for a positive experience of several participants. Continuous mentorship on EMR is essential to help healthcare providers attain mastery in the use of EMR.

*“Well like in (facility name) they ensured every room, every person, every individual and every health care worker has his or her own desk top which is connected to the EMR system and we have been sensitized on how to use it. If somebody new has been employed, ICT and the Data Clerks who are here, to sensitize or do a mentorship on the EMR system so that you may be able to use it efficiently so that it be of benefit to you” Clinical Officer 3, L4, Kisumu Central*

*“Like previously before trainings of course, you can’t be able to use something that you don’t know much about it so that was the biggest challenge but after the training at least things just got better “Clinical officer 2, L5, Kisumu Central*

### **4.3.5 Clinical Changes in Delivery**

This theme describes the various clinical changes healthcare providers felt have facilitated EMR adoption. The changes that healthcare provides have noticed include:



**Clinical Process** - The implementation and adoption of information systems in healthcare is a process of mutual transformation and has been reported that clinical workflow support is the highest-ranked indicator in the assessment of IT systems in hospitals and has a major determinant effect on HIS adoption .Therefore, it is essential to evaluate and redesign clinical processes and workflows (Zheng et al., 2020) , to ensure that they fit with the HIS thereby achieve a successful implementation .The respondents were contented with clinical changes the EMR came with as stated below.

*“It has improved most in terms of time taken for any data that I need, for example we have (facility name) sites then I can access it very fast. The EMR system that we use is Open MRS whereby if I need a patient’s data and I am not able to get the file, I just go to the system and I immediately get it as compared to where we needed the file to do everything. If I want to send a client for viral load, currently, I don’t need a file, I just go to the system, key in the name or key in the patient’s ID, I get everything I want and I just put it on paper and it goes.”* **Clinical officer 3, L4, Kisumu Central**

**Tracking of clients** – Healthcare providers need to see patients progress at a glance to improve their clinical outcome. EMR has enabled tracking of clients for patients who have not honored their clinical appointments to be easier than when paper was used. Some participants had the below statements to say;

*“That would be patient follow up. This is important with the HIV care and treatment because you need to know how the patient was previously, how they are*

*doing now and that helps you in making decision for the future. With the paper system you have to go back to the patient file every time to check this information, but with the EMR, you are able to do this thing just from your desk, by using desktop or the tablet. Patient information is quite easy to follow as opposed to doing through the files, every time. In most facilities, the files are usually quite a number, going to the shelves to look for specific files time and again is quite cumbersome but EMR has made it easy.”* **Clinical officer 1, L2, Kisumu West.**

*“EMR has improved mostly by tracking of clients. If you get a client, pausing as a new client and maybe he was enrolled in the EMR in the year 2013 or 2012. No problem, you just login to the EMR and get the details. It so much better for me, than the time spent to fill in the papers.”* **Clinical officer 1, L3, Kisumu Central**

**Elimination use of Paper** - A frequently cited positive effect of EMR use was improved confidentiality by elimination of paper records. Previously, the clinics were over-whelmed with paper management, making it difficult to keep charts from general view. Previously files used to move from one office to another.

*“Before EMR was there, a client comes to you and you would want to get something that relates to the client and it’s not in the file, you would walk from one room to another room, there was too much walking up and down because the information is not at one point. It wasn’t easy for you to get to know who has not come and who has come and how many people have stayed for long without coming so with the EMR you get it easily.”* **Clinical Officer 1, L2, Kisumu East**

**Workflow** - This is the physical interaction of the healthcare provider with information and with patients, which includes the amount of time needed to capture, retrieve and process information. The healthcare providers were positive about the improvement. Some of the interviewees had this to say.

*“The biggest change is the clients’ flow. It has really improved, and it really makes us to work comfortably with clients on time and no complains. As they arrive it just records the time the patient has arrived, and the clinic flows in that particular order.” Nurse 3, L4, Kisumu West.*

*“Workflow has changed, clients are able to take short time because the history of the patient is there, it is just clicking and moving to the next question. To me I can say that we are able to see the clients fully as per what is entailed to the HIV program. Unlike the old system where at times you can forget something.” Clinical Officer 1, L4, Kisumu East*

#### **4.3.6 EMR Support**

The type of support the participants have received which stimulates EMR use is:

**Technical support** – The participants have received technical support from ICT personnel and data clerks who are equipped with necessary technical skills to help troubleshoot the issues that arise with the EMR as it is being used in the facility.

*“We did not have IT person that was specifically employed to take care of the system. Right now, we have one though supported by the partner and at least he is always around so that if the system fails, he is consulted and it is rectified*

*immediately.” Nurse 2, L4, Seme.*

*“We have technical teams like the data resource center. These guys specifically check the difficulties, as for the WhatsApp group, it entails actually all those people who are using electronics. In case there is technicalities, we can always post it there or involve IT technical team so that they handle the issue.” Nurse 4, L4, Kisumu West.*

*“We have the IT personnel in the program and we consult them in case I need to do something, and I am stuck. I just make a phone call and they give direction or the person comes.” Clinical Officer 1, L3, Kisumu East*

**Informal support form colleagues** - In addition to the formal technical support the participant get, the participants said they were better able to use the EMR by talking and observing their colleagues using the system. That is how they borrowed strategies and also asked for specific help as illustrated below:

*“She is always available, is ready to guide you if you are interested.” Nurse, L2, Nyakach*

*“We usually share with the person concerned and if there is something to be done, they will do it and if they cannot they usually call the next level for support” Clinical Officer 4, L4, Nyando*

#### **4.3.7 Ease of Electronic Medical Records Operation**

The EMR software was found to be reliable and easy to use with timely screen changes. The areas cited that has made EMR easy to use include;

**Usability of EMR** – This attribute describes the functionalities of EMR and how it is in line to their daily work. The use of checkboxes, dropdown list has lessened the writing as they are seeing patients.

*“The EMR is simple, it’s easy to use and its friendly.” Clinical Officer 1, L2, Kisumu West*

*“When we used papers, we used to take a lot of time because you need to fill in. Our writing speed is different and so is typing. In EMR, you just tick, you just click and it records. But using paper, it used to take a lot of time.” Nurse 3, L4, Kisumu West*

#### **4.3.8 Electronic Medical Records Attribute**

This theme points out the aspects of the EMR that makes the healthcare providers adopt the system. Participants expressed satisfaction over EMR functionalities. Met information need encouraged users from fully embracing the EMR. Examples of these attributes are:

**Ease’s work/Retrieval of data** – Gets forms using manual is quite tedious and time consuming. The introduction of EMR has made it easier for HCP to perform their work with ease as patients come to the clinics.

*“We are able to access and pull our data quickly and easily with the EMR as compared to when we were not having it, then two when we want information that are missing in patient file, we are able to access them easily since they are available in the system. Then the data information in the EMR is.” Clinical Officer1, L4, Muhoroni*

*“Before you would look for a file, in the cupboard you don’t know where you kept it. But now you just click, the patients file is there and it’s easier, so you have more time with the client.” Nurse 2, L3, Kisumu East.*

*“Retrieving data is very easy. Currently we are using EMR, before I started using EMR, a client comes from another facility, they will not question details like admission in another facility. You would need her details, but the client does not know the number, only the name and so retrieving a file from bulk filling is hectic. Using EMR, retrieving with a name and typing the three names from the system is so easy.” Nurse 2, L4, Seme*

**Data accuracy** -When data is of good quality then users will be able to produce better outputs. As a result, it increases efficiency and lowers risk in the outcomes. With reliable outputs, HCP can improve their entire decision-making when seeing patients as some of the respondents has this to say.

*“Data accuracy has really improved. With the EMR we can pick the services that we are not providing to the clients and through that the MOH [Ministry of Health] can be able to assist us. Like as per now we think that cervical cancer screening was not being done for most of our clients, but with EMR we have realized its being done. MOH have partnered with KMET (Kisumu Medical & Education Trust) and this week is our cervical cancer screening for most of the CCC [Comprehensive Care Clinic] clients, yes. Clinical Officer, L4, Kisumu East*

*“When using EMR one cannot skip important variables. When using papers, one would skip some lines but when you go paperless you don’t skip you ask all those*

*variables the client needs to be asked.” Nurse 2, L3, Kisumu East*

**Data preservation** -Data preservation ensures reliable access to data when needed. EMR has introduced this benefit in health facilities which have enabled HCP experienced the benefits of faster access to data and better retention of data.

*“If it is a CD4 count data I want, I just get it from the patient’s data—specific question that I want. EMR simplifies everything as compared to before where I will need that hard copy, put it in the file and maybe if I have not stapled it well, it might get lost. Currently efficiency has really improved.” Clinical Officer 3, L4, Kisumu Central*

*“With going paperless at least end of the month, it’s easier to get your monthly report. One does not need to go searching for clients files physically and maybe the file has gotten lost or misplaced.” Clinical Officer 1, L3, Kisumu Central*

**Reminder/appointment** - Electronic reminders that are generated from patient data and delivered to the clinician during the clinical encounter have proven to be quite effective on HCP as they treat patients. According to (Coma et al., 2019), reminders were more effective than the existing monthly feedback system at resolving clinical situations. One participant from Muhoroni subcounty said that she prefers to use the EMR as it easily helps her identify those clients who are lost to follow up. Other respondents narrated as follows:

*“I know the clients I am supposed to see today, and also the other days so it’s way easier to track the patients we are going to see throughout the week. Once the patients miss their appointments, a popup message appears as a result, we get to*

*in the know.” Nurse 1, L2, Nyakach*

*“When I see clients with EMR at least I get to know all information; clinic appointment, previous laboratory test and maybe weight, maybe if the client is kept appointment or not. I also get to know from the EMR when the client is due to get viral load, it reminds me” Clinical Officer 1, L3, Kisumu Central*

*“It reminds me of the appointment like next week on Thursday I can readily know I have how many clients other than going to check in the files and books” Clinical Officer 1, L3, Kisumu Central*

**Reporting** – Reporting helps to improve decision making, management effectiveness. and responsiveness to issues. This component of EMR is amongst the biggest reason for use of EMR in the health facilities as participants reported that it has minimized their time it took when doing reports as suggested below.

*“In terms of reporting, people are leaving behind paper and if we stick to it, we might not do it as per the standards.” Clinical Officer 1, L3, Kisumu East*

*“When a report is required within a shorter time, you are able to generate it using the EMR” Clinical Officer, L4, Nyakach*

#### **4.3.9 Resources Availability**

The availability of resources like computers is a facilitator to EMR use. Some facilities acknowledge that the implementing partner have made efforts to ensure that they have computers/tablets to use for EMR. As one respondent stated below.



*“Yes, we have got enough computers” Clinical Officer 1, L4, Kisumu Central*

### **Need Factors**

These are the most immediate effects that relate to EMR use; they arise from problems that generated the need for use (Rachlis *et al.*, 2016). It comprises how aware the healthcare provider is towards the barriers and facilitators to EMR adoption. One of the respondents mentioned the need that makes her use EMR in the health facility:

*“There will be major consequences because one you will be missing patient data. Two, there will be long waiting time for the patients. Three, in terms of service provision, I believe actually it would have gone down. Four, you will not be able to get data as fast as you would want it so that you may make up some action plan very fast so everything will be in a mess.” Clinical Officer 3, L4, Kisumu Central*

*“Like you might be laid off because you are going against the policy of the organization. It is a good thing for us and the clients because you see clients are the primary beneficiaries of the program so if we are doing things for their good, then that is the primary objective. Then no because now if we do it a 100% we are denying somebody a job; the Data Clerks.” Clinical Officer 2, L4, Kisumu Central*

*“As a facility we are going to lag behind. That is a major consequence that we may face in terms of reporting and capturing data because people are leaving behind paper and if we stick to it, we might not do it as per the standards.” Clinical Officer 1, L3, Kisumu East*

#### **4.4 Barriers to the use of EMR by healthcare providers working in HIV clinics in Kisumu County.**

The study sought to explore barriers to the use of EMR by healthcare providers working in HIV clinics in Kisumu County, Kenya. Consequently, the study analyzed the question items from the interview guides to obtain the barriers. From analysis of the pre-disposing factors, the following barriers to the use of EMR by healthcare providers working in HIV clinics in Kisumu County were obtained:

- i. Attitude; Negative attitude toward EMR by healthcare providers
- ii. Belief; Healthcare providers having the belief that EMR's is not for them to use but other cadres like data clerks and HRIO's
- iii. Age; HCPs who were in the bracket age of 41-56 felt there was no need for them to use the EMR as they were almost retiring

The study identified 23 themes that were mentioned by participants that made them not to use EMR. The study merged the themes into 11 categories. Table 4.3 depicts the barriers hindering adoption of EMR in the health facilities in Kisumu County, Kenya.

Table 4.3: Barriers to Electronic Medical Records Adoption

<b>Predisposing characteristics</b>	
Negative attitude	
Knowledge/understanding of EMR	
<b>Disabling resources</b>	<b>Themes generated</b>
Inadequate training	Inadequate training
Lack of training	
EMR Does not populate register	EMR technical/usability issues
EMR missing some indicators	
EMR not working	
EMR not point of care	
Technical hitches	
Unavailability of computers	Resource scarcity/ Supporting hardware
Inadequate computers	
Computers get lost	
Slow/old computers	
Staff rotations	Human Resources constraints
Not enough personnel to use EMR	
Unstable Electricity	Unstable Electricity
Intermittent connectivity	Intermittent connectivity
Poor infrastructure	Poor infrastructure
Time	Workload
Workload	
Not point of care	
MOH support supervision lacking	Lack of EMR MOH support supervision
Integration of services	Integration of healthcare services
Ergonomic support	Ergonomic support
<b>Need factors</b>	
Physical Examination	
Time	

#### 4.4.1 Predisposing Characteristics

**Attitude:** Healthcare providers having a negative attitude toward EMR hindered its adoption in the healthcare facilities. The adoption of the EMR, largely depends on the healthcare providers attitude to be willing to embrace EMR and use it accordingly. The participant testimonial's is as follows:

*“Trainings are there, the problem is personality, people do not change from using the register to EMR.” Clinical Officer 1, L4, Nyakach*

**Belief:** Some healthcare providers have the belief that EMR's is not for them to use but other cadres like data clerks and HRIO's. This kind of thinking is a negative aspect to EMR adoption. One of the respondents had this to say;

*“When EMR was deployed in this health facility, it was the data guys to use mostly HIRO's and the data clerks. The clinicians were not involved in it, so we just assumed it's their thing.” Nurse 3, L4, Muhoroni*

This suggested that, the healthcare providers believe that data clerks and HRIO's are the ones meant to use EMR and not them.

**Age:** Respondents who were in the bracket age of 41-56 felt there was no need for them to use the EMR as they were almost retiring. A minority of the respondents felt, they were too old to learn new things as from the testimonial below.

*“Either I don't know how to use it or I don't have the interest. There are those people of our age who say that their age does not allow them. They would rather go home while you remain with the digital systems. So, when you leave it for them to use the digital, then they will not be able to use it,” Nurse 4, L2, Kisumu Central*

#### **4.4.2 Inadequate Training**

Capacity building and training is one of the most common barriers to EMR adoption. (Reid Jr., 2016) claimed obstacles such as inefficient training and support have contributed to the low adoption rate of EMR by healthcare providers. Training has different variants. Some interviewees indicated that a proper training need to be organized as compared to OJT's which is a common practice in the current trend in the health facilities where EMR has been deployed.

*“Then we can also have something like a formal training not just one job training. Formal training for clinical officers on how to use the system” Clinical officer 1, L4, Nyakach*

Additionally, another challenge in training that emerged from the respondents is that, there was lack of training in some health facilities;

*“It is just lack of much knowledge on EMR” Clinical Officer 1, L3, Nyakach*

*“The ones who have been mentored, use EMR, but there are some who have not been mentored, training should be done to the other staffs so that they can use the EMR” Nurse 2, L3, Kisumu East*

*“Knowledge gaps here and there, I am not a data person, I am not a health records person so my day is clinically set 90% the data is just 10% so there are things I may not be so good at. I may not be able to do something because I do not know how to do it maybe I need to be mentored or something like that” Clinical Officer 2, L4, Muhoroni*

Some participants acknowledged some form of training was done like OJT, but they felt it was not sufficient. The participants said that OJT type of training is not adequate time to learn the amount of information to use in the new system, and managing patients while training takes place. Proper training should be organized for them to understand the system better. Some views from the respondents were;

*“Being that it is introduced you cannot grasp everything at once, learning continuous. We have been introduced to it but there are some sections of EMR that we will still need more training so that we can get the concept right.”* **Clinical Officer 1, L3, Kisumu East**

*“EMR is a lot. It contains the Care and Treatment where we have these our clients, the ones you are seeing enrolled here. Then partly we have those who are taking PrEP, they are enrolled on the other side. Then we have the PMTCT mothers, they are enrolled with their babies and that is entailed in the EMR, it is interdepartmental. We need all these people brought together, each person with a tablet and then we merge everything then it moves smoothly. We need On Job training frequently, when you are posted in that department.”* **Clinical Officer 1, L3, Kisumu East**

#### **4.4.3 Electronic Medical Records Technical Issues**

To the many issues that hampers widespread and adoption of EMR ,one key issue is claimed to be usability as stated by (Duftschmid et al., 2013). The usability issues can be categorized into the following categories:

**System glitches or bugs** – This happens when the EMR delays as the healthcare

provider is entering the data into the EMR. By “delay,” we mean that the clinician was stopped while the EMR was open and processing. When the computer system crashed, the clinician could do little until it was returned to working order. A few of the respondents from the interviewees are: -

*“We use it often when it is working because you know it uses internet, sometimes when the net is down, we go manual, but basically, we are supposed to and required to use it most of the time because we have gone paper less. At times when it does not work then we just go manual, but again we have to feed the data later once we are done when the network comes back” Nurse 4, L4, Kisumu Central*

*“At times it is frustrating, you have the client there, EMR goes off (I laughs) that one is a very big challenge so you have to sit explain to this client that it is not working. It will take time as you call the people responsible, it is a frustration and it is a problem.” Nurse 1, L5, Kisumu Central*

**EMR not capturing all aspects of client care** – Healthcare providers felt that the EMR did not capture did not capture all aspects of patient care. This in turn makes them not enthusiastic to use the system as stated below by some of the respondents.

*“When you follow EMR so much, other things are not elicited like physical examination and other things are not maybe entered in the EMR and other things you are forced. You could have noted on the EMR but it doesn’t capture for example physical examination and other tests you have to do outside the HIV opportunistic infections.” Clinical Officer 1, L3, Kisumu Central*

*“EMR should have a provision of someone to input their opinion. EMR is more of*

*routinely but now some other thing that someone would like to add, there is no big space for that.” Clinical Officer 1, L2, Kisumu East*

**EMR failures preventing access to patients’ records** - When a HCP using an EMR crashes or not working while patients is around denying access to patients’ records frustrates them as implied in the testimonial below.

*“I would want to know what did this client suffer from on a given day in the EMR and that input was not well captured, that is it. On the other hand if you go to the files you will see proper management, findings well written down. In EMR I still see it’s not coming out clearly.” Clinical Officer 1, L2, Kisumu East*

#### **4.4.4 Supporting Hardware**

**Inadequate resources:** this refers to computer resources such as desktops, tablets that are used for data capture in EMR. When the resources to use the EMR is not enough the healthcare providers

*“You only have one machine and sometimes we are two clinical officers we want to get the same report, the data clerk is also busy with that desktop. The one thing that can help us is provision of more machines” Clinical Officer 2, L4, Nyakach*

*“Like a clinician I expected the system (desktop) to be on my desk, where I see patients. In my case, we don’t have enough resources like computers in every clinical desk so not all are able to key in this information directly as clinicians.”*

**Clinical Officer 1, L4, Muhoroni**

*“Computers are not enough; definitely tablets would be preferred in point of care,*



*compared to the desktops. Even the desktops are not enough for everyone to use. In terms of resources they are not adequate.” Clinical Officer 3, L2, Kisumu Central*

**Slow /old computers** - The EMR being slow was perceived as a barrier to its adoption.

*“What motivates us is when we are given the gadgets which are working. If they are not working that one is a problem. Some of the gadgets that we have are very old thus frustrating and they don’t motivate.” Nurse 1, L5, Kisumu Central*

#### **4.4.5 Human Resource Constraints**

**Staff rotations** - Some participants indicated that staff rotations were an important barrier to the adoption of EMR in a health facility. The health facility trains their staff, then shortly after they become better and the health facility is on track, they healthcare provider has been transferred to another facility. This was termed as one major demotivator to the use of EMR as in most cases you get a healthcare provider who has not been trained.

*“We have frequent transfers of personnel. You see somebody has been trained, she is good in this, and then get transfers to another facility.” Clinical Officer 1, L2, Kisumu Central*

#### **4.4.6 Unstable Electricity**

Lack of reliable electrical power backup and network connectivity proved a major barrier to successful EMR adoptions. The participants said that could go down at any time and could be out for as long

*“The only thing, I had talked about is that issue of power. When power is not there with no backup, you can't use EMR.” Clinical Officer 1, L3 Nyakach*

*“We use Kenya EMR that needs constant internet and then we also need electricity to be there. Now that we are using the desktop, when the power goes off we can't access information.” Clinical Officer 1, L2, Kisumu East*

#### **4.4.7 Intermittent Connectivity**

In some circumstances, there is network connectivity so the EMR remained operational, data transfer speeds were unpredictable and could slow the EMR so much that screens could take one to three minutes to load. System-related slow-downs forced maintenance of parallel paper-based systems and developed workflows for data re-entry from paper backups after power or Internet down-times.

*“Sometimes in EMR we actually experience delays, the networks and everything as well as system hanging. As a result, we can't access the information and you know that affects clinical work. We normally work on basis on you take the shortest time possible to help a client.” Clinical Officer 2, L3, Nyando*

*“We use it often when it is working, it uses internet and sometimes when the net is down, we go manual. Going manual is not allowed, we are required to use it most of the time because we have gone paper less. Unfortunately, we have to feed the data later once we are done when the network comes back.” Nurse 4, L4, Kisumu Central*

#### **4.4.8 Poor Infrastructure**

To support comprehensive EMRs, infrastructure must be in place. For example, the EMR's should be integrated to multiple points that the patient might be seen by a healthcare provider. To successfully ensure that healthcare providers adopt EMR at all points good infrastructure should be at the health facilities.

*“The only place where we have the computers is the data room. In the clinical we don't have.” Nurse 1, L2, Nyakach*

#### **4.4.9 Heavy Workload/ Not Point of Care**

Concerns from participants indicated that EMR may negatively impact workload as they are required to enter data on both paper and on EMR. The healthcare providers cited loss of efficiency produced by the use of technology such as more time needed for data entry, less time spent with patient interaction. Maintaining a 'hybrid' paper-electronic system proved time consuming and added workload to them. Completing the paper form then the filling in the EMR creates “double documentation” burdens for some providers, thus adding to their workload. HCP indicated that EMR's added time to their workday, as the use of the systems required significantly more administrative time than that required for documentation in paper forms. Some interviewees had this to say.

*“I use it very rarely for reasons like workloads. In this facility, it is integrated, we are seeing both CCC clients and general outpatient so there are many patients. It makes it difficult for you to do EMR when clients are waiting. It does take time because it is not fully point of care where you do everything on the computer, you*

*still have to fill the file so it's like double work so I use it though very rarely."*

***Clinical Officer 3, L2, Kisumu Central***

*"I update files and at the same time update EMR so that is kind of double work.*

*When we go completely paperless, it will be easier."* ***Clinical Officer 1, L3,***

***Kisumu East***

*"This facility is high volume site so clients are so many and if you do double work*

*it will take longer time as compared to the facility that is low volume, has like 50*

*clients or 20 clients. Here we see almost 300 and if you use that EMR and the file*

*at the same time, they(patients) will take long time"* ***Clinical officer 1, L4, Kisumu***

***Central***

Some indicated the heavy workload was because the EMR was not point of care but rather retrospective.

*"The only thing is, and I will always say this again and again, is that we don't need just EMR we need point of care. EMR does not really help much because if it's still*

*writing in the files and writing in the system so point of care means, you do*

*everything purely in the system, no paper work at all then it will be efficient. EMR*

*is good but it is not giving us what we want."* ***Clinical Officer 3, L2, Kisumu***

***Central***

*"No, we are supposed to fill in the EMR at the same time the register. When you do*

*it like that, the clients take longer waiting time for us to see them. The effects is,*

*clients get tired and especially in the antenatal clinic, you find them giving up on*

*the way and going home."* ***Nurse 3, L4, Seme***

#### **4.4.10 Ministry of Health Supervision Lacking**

Site supervision from the MOH is an activity that is scheduled and happens regularly. During facility supervision, the MOH checks all aspects of the healthcare but unfortunately do not take time to check the EMR aspects. From the participants that responded, this makes HCP neglect the EMR aspects, since supervision do not consider the aspect important.

*“It can be better. If you see a client, you enter the information on EMR and forget about the register. When MOH come for site supervision, they look at this register, this is what the supervisors come to look. They are not ready to open the computer check. It is this register and you know what they want is what we give.” Nurse 3, L4, Seme*

*“The problem is when we have support supervision that comes from the county, the county still insists on the hard copies. Every quarter, we print the register for three months. If they want to confirm something, they just use the hard copies originated from the soft copies.” Clinical Officer 1, L4, Nyakach*

*“Okay you know when government team come. We call them MOH team. They normally don’t supervise us cause us we are under a service Delivery Partner. They supervising the MOH team, in which the MOH team are not using the EMR. EMR is only for HIV for the Service Delivery Partner. MOH team don’t influence as much, us we are being supervised by the partner” Clinical Officer 2, L2, Kisumu Central*

*“I can say that we are moving into a world of technology and if we want to*

*embrace the EMR uptake, we need to channel these other functions of EMR to MOH fully. A partner can be very willing to give you all the processes but at the end of the day, MOH will come and needs data in hardcopy and not soft copy. Incorporating stakeholders will make it a bit easier for the uptake.” Nurse 4, Level 4, Kisumu West*

#### **4.4.11 Integration of Services**

Integration of services in this study refers to seamlessly able to use the EMR across various departments like laboratory, pharmacy and nutrition service points. It also indicates the ability of healthcare providers to use the EMR with all patients who come to the HIV clinics regardless of their HIV status.

*“I think we can also try and see how we can liaise with the MOH, so that the other departments also can go paperless.” Nurse 2, Level3, Kisumu East*

*“If we decide to go EMR, let it not only be HIV care. It should include all clients who have come to the facility, such that everybody sees it is electronic and everybody is going electronic. Confusion comes in, when on one day I am using electronic the other day paper then it brings the issue of is it really paperless.”*

*Nurse 4, Level2, Kisumu Central*

#### **4.4.12 Ergonomic Support**

Other barriers that were mentioned that pose a challenge when using the EMR is the neck pains the healthcare providers face while using the tablets provided. This is what one respondent had to say.

*“Like also now, you see the way I am using my POC, I have improvised how I am*

*using the POC because it is not comfortable at all most of the time we get neck problem, you cannot use the tablet like this and you are seeing so many patients in a day, so it also gives us hard problems, you see now I have improvised” **Clinical Officer 1, L4, Kisumu West***

#### **4.4.13 Need Factors**

The perception of healthcare providers towards disadvantages or importance of an EMR can negatively influence his adoption in his/her daily duties. For instance, some participants felt with the introduction of EMR interaction with the patient will be affected.

*“When you follow EMR so much, other things maybe elicited like physical examination and the other tests you have to do outside the HIV opportunistic infections” **Clinical Officer 1, L3, Kisumu Central***

Also, most felt, there is no change as, they are still writing on paper to take to pharmacy and lab one respondent stated below.

*“As per now there isn’t because we still use the files. We still write on paper when the patient goes to the pharmacy or lab. If it were improved a bit then we would have eliminated the paper. Basically, I don’t see if there is any aspect that has been eliminated so far. For the effects to be fully realized the, all aspects of clinical care should embrace the EMR.” **Clinical Officer 1, L4, Kisumu Central.***

## **CHAPTER FIVE: DISCUSSION**

### **5.1 Introduction**

This chapter presents an interpretation and discussion of the study findings. The findings are summarized in line with the research question which was: What factors influence healthcare providers to adopt EMR in HIV Clinics, Kisumu County? This study was also guided by two objectives: to describe facilitators to the use of EMR by healthcare providers working in HIV clinics in Kisumu County and to explore barriers to the use of EMRs by healthcare providers in HIV clinics in Kisumu County. The two specific objectives were tested and are greatly supported by data with certain themes emerging more strongly than others.

### **5.2 Facilitators to the Use of Electronic Medical Records by Healthcare Providers**

Facilitators are factors that are significantly associated with EMR adoption by



healthcare providers. The predisposing factors in Anderson and Newman framework has 3 aspects that can affect utilization of health services. This demographic category consists of age and sex variables. Respondents (83.4 percent) in the study were under the age of 40, which could signify a broad exposure to computers prior to their medical practice experiences. The participant above age 40 years was a very small percentage of 16.7 percent that showed some negative perception towards adopting EMR citing they were almost retiring.

Other predisposing factors mentioned either acted as a barrier or a facilitator (such as belief, attitude, knowledge of EMR) depending on the situation. For instance, healthcare providers attitude had an impact on the adoption of EMR. Healthcare providers who had a favorable attitude enabled them embrace EMR with ease as compared to the those whose attitude was negative.

Some respondents from the research felt their positive attitude and willingness to change helped them use the EMR for their daily tasks. As had been identified by studies, successful implementation and adoption of EMR is associated by the willingness of healthcare professionals to use (Adedeji et al., 2018). The knowledge, values and beliefs of healthcare providers have towards EMR is what determines their adoption to EMR.

Emerged themes that enable EMR adoption which are consistent with the literature review are: a) Management support; b) Perceived benefits of EMR c) Technical support; d) Training and capacity building; e) Ease of operation; f) Changes in delivery; g) Resources availability; h) Environmental factors.

**Management support:** In this present study, respondents said that management

support is key to adopting and using EMR. The statement is in line with the study conducted by (Muhaise et al., 2019) which supported that management support is key in EMR adoption. The findings reflect that healthcare providers expect the management to provide adequate support for training, computer provision to use EMR, personnel to help in data entry, provision of backup power for electricity to support EMR. The healthcare providers also mentioned that when management addresses their challenges related to EMR, it prompts them to continue using EMR. The findings support those found in the literature review.

**Perceived benefits of EMR:** The benefits EMR system have achieved in the healthcare facilities include data accuracy, easy retrieval of data, timeliness in reporting, data preservation and reminders of appointment. The promises the benefits EMR holds to improve the quality of care to patients has been a big motivator by the healthcare providers to continue its use. Which is consistent with the literature regarding patient care (Aljarullah et al., 2018).

**Technical Support:** Healthcare providers mentioned support as one of the contributors to the use of EMR. Supports has 2 dimensions; technical support and colleague support. Technical support is considered as support received in resolving an EMR problem from a trained ICT personnel or HRIO while colleague support is considered as support received in resolving an issue from or with a fellow workmate. Some respondents mentioned that, before calling for technical support, they would ask their friends or colleagues who use the system which has had positive impact on their acceptance. Managers and supervisors can identify and motivate champions from the healthcare providers who would encourage EMR use

among their peers. This theme is consistent with literature review highlighting that both technical and colleague support is vital to facilitate EMR adoption.

**Ease of operation:** This theme highlights the perceptions by healthcare providers of the complexity of EMR. Some participants believed that the EMR was simple and friendly to use since it incorporated features like dropdown lists and checkboxes. The features provided a user-friendly environment thus encouraged them to use the system in their daily tasks. From the literature, if users perceive that using a system is free from effort and they understand the system, then they are inclined towards adopting (Msiska et al., 2017). Some literature review also states that the greater the perceived ease of use of EMR's by healthcare providers, the greater the adoption (Ajami & Bagheri-Tadi, 2013a).

**Training & Capacity Building:** On Job Training (OJT) was mentioned by several participants as the type of training that is conducted. This kind of training has been appropriate as it is easy to organize and the training completed within a short duration of time as well as impacting them with targeted useful information needed for the use of the EMR. Learning through experience has in turn empowered them to confidently use the systems and increased their productivity. Similarly, literature review states that adequately training of staff in hospitals in EMR enables the users to gain proficiency resulting to improved productivity (Katurura & Cilliers, 2018).

### **5.3 Barriers to the Use of Electronic Medical Records by Healthcare Providers**

The study sought to explore barriers to the use of EMR by healthcare providers working in HIV clinics in Kisumu. The findings are discussed below.

They are resource scarcity, intermittent connectivity, EMR technical challenges, inadequate training, human resources constraints, supporting hardware, poor infrastructure, workload, unstable electricity, lack of integration of services and lack of EMR MOH support supervision.

**Support Hardware:** Inadequate computers to use for EMR by healthcare workers in health facilities is as cited by respondents as a setback. In some health facilities, the clinical rooms of the healthcare workers did not have the computers to enable them use EMR effectively, creating an environment for healthcare providers to share the scarce resource. This in turn poised a challenge to fully use EMR for real time data entry. In some instances, the computers were available to use for EMR, but when they got lost, the mechanism put in place to replace is a tedious process hence the HCP has to source for alternative ways to get a tablet/laptop to enable them continue see patients. This proved a challenge if the healthcare provider did not have that alternative to replace the tablet/laptop in a timely manner. In other health facilities, the computers (laptops, tablets) are available but are not dependable, they were either too old or slow to be effectively used. This challenge is similar with what has been reported in the literature review by (Yehualashet et al., 2021).

**Heavy workload:** Heavy workload experienced by HCP, is as a result of data entry

of patient's data both electronically (EMR) and manual (paper based). From the participants, double entry happens in instances where EMR stops functioning while seeing a patient. Sometimes, the healthcare provider is forced to wait for the system to normalize, before continuing providing care. Mostly the patient is disgruntled, and this forces the provider to continue care using manual records. Such instances happen in other circumstances such as computer being too slow or the health facility has many patients awaiting to be seen. In instances where they see the client's using manual, they have to look for time to transcribe the paper records to the EMR. This felt like double work and would wish for the EMR to work better to eliminate this workload. (Kruse et al., 2016) suggested that adoption of the EMR reduces when the healthcare provider's workload increases.

**Staff rotation:** In most health institutions, staff rotation is common as it has many benefits like improving an employee's learning. However, in this study, staff rotation is cited as a barrier to EMR adoption as inefficiencies are introduced. When a healthcare provider joins a new health facility, they need to learn the ropes before reaching their optimum productivity level especially when they are from health facilities that EMR was not implemented and vice versa. This type of staff rotation often leads to frequent interruptions in EMR use. Staff rotations is inevitable in the health care setups, but to ensure we milk the benefits, the rotations should be done periodically and fairly according to (Melnick et al., 2021).

**Integration of services:** Some participants believed EMR should have the ability to connect to other department seamlessly as well as able to see all patients who

come to the clinics, regardless of their HIV status. Currently, the healthcare providers use the EMR system only for HIV patients while the clinic has other patients who visit. This was cited as cumbersome to keep switching between paper and electronic, thus they would at times not use the EMR at all and concentrate on paper. Literature review suggests from other studies such as (Wang, 2019), suggestions that integration of EMR system can enable efficiencies in operations and provide patient centric platform. This would motivate HCP to fully embrace EMR when full integration happens in all departments of the hospital.

**Inadequate training:** According to (Furusa et al., 2018) continued EMR training is vital to healthcare providers to enable them master and use EMR effectively. The staff need to be adequately trained using various methods to give them confidence in using the system. Provision of sufficient formal training, including continued training for staff, is a key strategy for a positive experience of several participants. It was noticed from the study, OJT was the common training that HCP were exposed to. The participants trained using OJT mode only, were dissatisfied with the training they received and yearned to know more aspects of the EMR which they could not get with that mode of training. Initial effective training and continuous training is important to impact confidence and improve efficiency. This is consistent with the literature review by Reid Jr. (2016) suggesting that recommendation of mandatory refresher trainings should be incorporated. Other forms of training that could be incorporated with the OJT to motivate the healthcare providers are classroom training and forums where the healthcare

workers exchange ideas.

**EMR technical hitches:** These technical hitches mentioned by participants include software bugs in the EMR or the computer hanging. Participants who experience the said EMR technical hitches while in session with a patient, contributed to lose of confidence in the use of EMR. (Jawhari, Keenan, et al., 2016) mentioned the EMR unreliability has a correlation to its adoption. Strategies should be put in place to equip the healthcare providers with troubleshooting tips when such challenges arise.

**Ministry of Health Support Supervision:** From literature review, support supervision is a facilitator to EMR use by healthcare providers by Gyamfi 2017. However, the literature review differs from findings in this study where participants indicated that, MOH personnel during supervisory meetings do not focus to check on EMR and are most interested in manual registers. Most healthcare workers in HIV clinics, are contracted by them to support patient care in these facilities, so when MOH personnel do not take a keen interest in supervising the EMR system, the healthcare providers tend to have laxity attitude to its adoption.

**Environmental Factors:** Environmental factors are known to either impede or foster EMR use. In relation to EMR, these factors include connectivity and electricity. The two factors are a common concern in most developing countries. In most healthcare facilities unstable electricity is a major contributor to lose of confidence to adopt EMR. Participants mentioned that lack of adequate power

backup is a disruptive concern and are optimistic to have a more stable form of electricity. This concern was raised by healthcare providers who use desktops and their UPS were not optimal. Most healthcare facilities did not have their connectivity equipment (switches, routers) on an alternative form of power back up, during electricity disruption use of EMR was compromised. The healthcare providers who used tablets were not adversely affected as long as the power disruption did not take more than a day, which in some health facilities this was a reality. Interestingly, some healthcare providers interviewed in this study mentioned that solar panels were presently being installed at their facility and hopes it will solve the problem of inadequate power supply.

Connectivity in this study meant both internet and network connectivity. Internet in the healthcare facilities was mostly available by use of modems which proved to be unstable. While on the other hand, network connectivity is the infrastructural cabling/access of the clinical rooms to access the EMR. Most participants mentioned the intermittent mode of connectivity at the health facilities, dampen their interest to use EMR in their daily task.

**Clinical Changes in delivery:** This theme describes the different changes the EMR has brought to the healthcare facilities such as tracking of clients and workflow. In the literature review clinical workflow is termed as a barrier to the use of EMR by health care providers as stated by Ajami & Bagheri-Tadi, 2013. However, in this study, healthcare providers regarded the workflow change as a great facilitator to the use of EMR as it they were able to serve patients on time with no or minimal complaints and the patients flow was much better.



## **CHAPTER SIX: CONCLUSION AND RECOMMENDATION**

### **6.1 Introduction**

The main objective of the study was to identify and explore facilitators and barriers to the adoption of EMR in HIV clinics in Kisumu County as perceived by healthcare providers. This chapter presents the conclusion and recommendations based on the findings from the study.

### **6.2 Conclusion**

This study achieved its aim in capturing healthcare providers' perception regarding their experiences in adopting EMR. Based on the study findings presented and discussed above, conclusions can be drawn as follows: -

#### **Facilitators to Electronic Medical Records Adoption by Healthcare Providers**

From healthcare perspective, the facilitators identified in this study represent a starting point to the EMR use which the MOH, policy makers and implementers can take advantage of. Among the facilitators mentioned by healthcare providers include; benefits EMR holds such as; data accuracy, data preservation, ease of work, reminder and reporting; has motivated them to continue using the EMR. Management support refers to provision of computer resources to use at the facilities, hiring of data clerks to help data entry in instances, the healthcare provider reverted to using manual has been received well and boosted them to embrace EMR. Features of EMR like checkboxes and drop-down lists which has

minimized typing has been well received and made the EMR easy to operate. Technical support both from ICT experts, HRIO's and support from colleagues and EMR champions identified have facilitated the use of EMR by health care workers and is consistent with (Gyamfi et al., 2017).

### **Barriers to Electronic Medical Records Adoption by Healthcare Providers**

In conclusion, the findings from this study provide valuable information that health policy makers, implementing partners and other relevant authorities should be aware of as they plan to accelerate adoption of EMR.

With such level of detailed explanation, this study both supports the theoretical understanding of each barrier and helps inform areas of priorities and weaknesses when putting in mechanisms to enhance EMR as well as address the barriers for successful EMR adoption.

### **6.3 Recommendations**

Findings identified in this study are crucial and suggests that to enhance EMR use, the stakeholders need to embrace the facilitators and enable intervention mechanisms to address the barriers. The findings may assist various stakeholders such as MOH public health department, health facilities administration and implementing partners to stir up conversations on strategies to overcome the challenges. The following are suggestions to address the barriers to EMR adoption. Some recommendations for immediate consideration to various target people:

## **Implementers**

- i. Implementers should continually organize all-inclusive EMR trainings, workshops and seminar sessions to increase healthcare workers confidence in using the system.
- ii. Implementors can potentially lay out a plan on timely repair of computer resources in health facilities whose computers are malfunctioning.
- iii. Implementors should consider ergonomic aspects of healthcare workers while introducing computer resources in health facilities. Research on accompanying resources for tablets or laptops to alleviate problems that arise from lack of ergonomic support.
- iv. Implementors should strive to ensure there is a reliable connectivity both internet and network connectivity in health facilities.
- v. Facility in charges with implementors can potentially plan on provision of adequate computer resources to healthcare providers.

## **Policy Makers**

- i. Health Policy makers should create forums where the healthcare providers from different health facilities meet to share best practices and challenges that they encounter.
- ii. Policy makers can potential have a dedicated plan with the various stakeholder to discuss on how the standalone software's in various department in the health facilities can integrate and make EMR as point of

care. Point of care has a potential to help in workload reduction.

- iii. The MOH should take up ownership of EMR and include it in support supervision as an element of CHMT evaluation.
- iv. Policies and strategies should be devised on how EMR integration especially at HIV clinics that provide care to non-HIV patients.

#### **6.4 Suggestions for Future Research**

From the findings of this research, promising area for future research is a longitudinal design and includes other methods such as observation. It would be important for future research to include a larger geographical area.

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## APPENDICES

### **Appendix I: Participant Informed Consent Form**

**Study Title:** Facilitators and Barriers to Electronic Medical Record Systems adoption in HIV Clinics, Kisumu County

**Principal Investigator:** Elizabeth Muga

**Institution:** Moi University- School of IBMI

This health facility is among the facilities that have been purposively selected to participate in this research study. You, as healthcare provider have been selected to participate in this research study. The aim of this study is to get your perspective on facilitators and barriers to adoption of Electronic Medical Record System in HIV Clinics in Kisumu County. It involves answering some questions with regard to your experience with the use of EMR. Please know that your participation in this study is voluntary and you are free not to answer any question that you feel uncomfortable about. But since we value your opinion so much, we hope you will fully participate in this study. Your participation along with this interview is a private matter, and will keep these proceedings confidential. The results will be presented and published in such a fashion that will make the participants unidentifiable.

The information that shall be collected will help better understand the reasons for and against the uptake of EMR. I will audio record this interview along with taking notes. The session will take roughly take 30 minutes. I would very much appreciate your participation in this study. Do you want to ask me anything concerning the

study?

I have read the consent or has been read for me in a manner that is well understood before signing the consent form. I have been given an opportunity to ask questions and have been answered satisfactorily.

I hereby volunteer to take part in this study.

Yes

No

**Date:** \_\_\_\_\_

**Level of Health Facility:** \_\_\_\_\_

**Cadre:** \_\_\_\_\_

## **Appendix II: Interview Guide**

### Part 1 (Demographic Characteristics)

Gender	Professional Cadre
Number of Years in Service as a healthcare provider	Health Facility
Level of education	Age

### Part2 (Interview Questions Guide)

#### Brief History on use of EMR at the facility

1. When was EMR initiated at your facility? How often do you as the healthcare provider use the EMR?
2. Describe the advantages of EMR system in this health facility
3. What has improved the most with the existing EMR system?
4. How has your daily workflow processes changed since transitioning to EMRs?

#### Facilitators to EMR adoption

5. What is the comparison of time spent with patients before and after EMR implementation? What aspects of patient care are affected by the use of EMR?
6. What clinical processes did you eliminate or create when you implemented the EMR system?
7. In terms of overall office and clinician productivity time and cost, what is the comparison of the clinician/nurse typing or a data clerk keying in the data you have put on paper?
8. How do you view possible consequences of noncompliance with adopting an EMR system?
9. Has the management supported the EMR use in this facility? How?
10. Have you faced any problems using EMR system? If Yes, what steps do you take to identify and resolve the problem?

#### Barriers to EMR adoption

11. What factors or circumstances have made it difficult or impossible to use the EMR system?
12. Are the resources (computer, tablets) adequate to promote the use of EMR?
13. Are there any other factors that come to mind when you think about not being able to use EMR?

#### Ending questions

14. What factors would help [have helped] promote uptake of electronic health records in your facility
15. What more would you like to add that would be beneficial to this study?