UTILIZATION OF ELECTRONIC MEDICAL RECORDS BY DOCTORS AND CLINICAL OFFICERS IN COMPREHENSIVE CARE CENTRES IN NAIROBI COUNTY, KENYA

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DECLARATION

This research project is my original work and has not been presented for a degree in any other university

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DEDICATION

This research project is dedicated to my family who have been awesome throughout my studies, your love and support can be equated to none. Thank you!

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First I wish to acknowledge God Almighty, for the gift of life and enabling me sufficient grace to complete my Master's program, all Glory and honor belong to him

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ABBREVIATIONS AND ACRONYMS

AIDS:	Acquired Immune Deficiency Syndrome
ART:	Antiretroviral therapy
CCC:	Comprehensive Care Centre
CDSS:	Clinical decision support systems deployment and use
DDIU:	Data Demand and Information Use
EMR:	Electronic medical records
EHR:	Electronic Health Records
HCW:	Health Care Worker
HIV:	Human immune deficiency virus
EMR:	Information communication technology
KNH:	Kenyatta National Hospital
MOH:	Ministry of Health
SPSS:	Statistical Packages for Social Sciences
TAM:	Technology Acceptance Model
TPB:	Theory of Planned Behavior
TRA	Theory of reasoned Action
TB:	Tuberculosis
VCT	Voluntary Counseling and Testing
WHO:	World Health Organization

ABSTRACT

Electronic medical records (EMRs) have been introduced to replace the paper-based health records system at comprehensive care clinics (CCCs) in hospitals across Nairobi County, Kenya. The objective of this study was to assess the utilization and effects of EMRs as a continuous quality improvement tool among doctors and clinical officers in these hospitals. Specifically, the study aimed to determine the levels of EMR utilization among doctors and clinical officers in HIV and AIDS CCCs in Nairobi County, identify health workers' perceptions about EMR utilization in these services, and establish the factors influencing EMR utilization in HIV and AIDS services provided by the CCCs in Nairobi County. This was a descriptive cross-sectional study. Participants, consisting of 100 doctors and clinical officers, were selected through proportionate stratified random sampling from 41 HIV and AIDS CCCs across both public and private hospitals in Nairobi County. Data were collected using questionnaires and analyzed with Statistical Packages for Social Sciences (SPSS) Version 21. Both inferential and descriptive statistics were employed. The study revealed high levels of EMR adoption among health workers, with all CCCs in Nairobi having installed EMRs, allowing personnel to use these systems daily. The adoption of EMRs resulted in improved efficiency within the CCCs of Nairobi County. However, the study also identified challenges, such as difficulties in accessing records during power blackouts. Regarding the influence of health workers' perceptions on EMR utilization, the study found that factors such as access and speed, ease of navigation, and efficiency impacted the use of EMRs in CCC services. Additionally, organizational factors were found to affect EMR adoption, with management support of innovation significantly influencing health professionals' willingness to adopt EMRs. Technical factors also played a role, as facilities that adopted EMRs experienced relative advantages that influenced their decision to implement these systems. Furthermore, external environmental factors impacted EMR adoption, as EMRs helped health facilities address competitive pressures. The study also identified challenges in EMR implementation, including issues with selecting appropriate EMR systems and the transition from paper-based to electronic systems, which require careful planning. The study concluded that EMR adoption has enhanced the efficiency of services in health centers in Nairobi County. It recommends a concerted effort by all stakeholders to address potential barriers to EMR adoption and utilization in CCCs.

CHAPTER ONE: INTRODUCTION

1.0 Background of the Study

The provision of optimal healthcare is the primary aim of every health institution. Accurate and timely information from all service delivery points for every patient encounter is required to achieve this objective (World Health Organization, 2020). The introduction of communication and technology for the processing, transmission, and sharing of information electronically has proven useful in providing quality and timely healthcare. Challenges associated with paper-based systems for patient record management have included occurrences of lost files containing valuable patient follow-up information, the inability to provide holistic patient care, and difficulties in evaluating care and treatment using measurable indicators (McDonald, 2022).

Comprehensive Care Centers (CCCs) are specialized healthcare facilities designed to provide integrated and holistic care for patients with chronic conditions, such as HIV/AIDS, tuberculosis, and other long-term illnesses (World Health Organization, 2019). These centers are typically located within larger healthcare facilities to streamline the delivery of services, including medical treatment, counseling, and patient support. CCCs play a crucial role in managing chronic diseases by ensuring continuity of care and addressing the multifaceted needs of patients (Murray et al., 2019). In Kenya, CCCs are pivotal to the country's healthcare strategy, particularly in managing the HIV/AIDS epidemic, where they are strategically positioned within hospitals to enhance accessibility and utilization of healthcare services

Electronic medical records (EMR) refer to the existence of medical records in digitized format that can be updated, accessed and archived. In addition, EMRs can provide features such as reporting and analysis of trends and deviations from set norms (Amalia, 2021). Globally, the utilization of Electronic Medical Records

(EMR) has become a cornerstone of modern healthcare, driven by the need to improve patient care, enhance efficiency, and ensure accurate record-keeping. In the United States and Canada, EMR adoption is widespread, with over 85% of physicians using EMR systems as of 2017 (Hsiao & Hing, 2020; Office of the National Coordinator for Health Information Technology, 2019). In contrast, countries like Pakistan, Nigeria, and South Africa face varied challenges in EMR adoption, ranging from technological limitations to financial constraints. In these countries, EMR utilization in CCCs and other healthcare settings is often limited, with adoption rates significantly lower than in North America (Khalid et al., 2018; Ojo et al., 2019; Godfrey et al., 2021).

Technological factors play a significant role in the adoption and utilization of EMR systems in CCCs. Reliable internet connectivity, the availability of user-friendly software, and robust data security measures are essential for the successful implementation of EMR systems (Ajami & Bagheri-Tadi, 2013). In countries like Nigeria and South Africa, inadequate technological infrastructure has been a barrier to widespread EMR adoption, particularly in rural areas (Ojo et al., 2019; Godfrey et al., 2021). Similarly, in Kenya, challenges such as poor internet connectivity and the high cost of EMR systems have hindered the full realization of EMR benefits in CCCs (Were et al., 2015).

Organizational factors also significantly influence the adoption and effective utilization of EMR systems. These factors include the commitment of healthcare facility leadership to digital transformation, the availability of continuous training for clinicians, and the overall organizational culture regarding technology adoption (Munyisia et al., 2021). In healthcare systems where leadership actively supports the implementation of EMR systems, there is a higher likelihood of successful adoption

and utilization (Hussain et al., 2019). In Kenya, particularly within Nairobi's CCCs, organizational challenges such as resistance to change, limited staff engagement, and insufficient technical support have been noted as barriers to effective EMR utilization (Kivoto et al., 2018).

The transition from paper-based records to EMR systems offers numerous benefits, including improved accuracy and accessibility of patient records, reduced errors, and enhanced data management capabilities (Nguyen et al., 2014). EMRs facilitate better clinical decision-making by providing healthcare providers with comprehensive and up-to-date patient information. Moreover, EMRs support data analysis and reporting, which are crucial for monitoring patient outcomes and optimizing care, particularly in CCCs where managing chronic diseases requires detailed longitudinal data (Shekelle et al., 2016). Despite these benefits, the transition to EMRs is complex and requires addressing technological, organizational, and cultural challenges to ensure successful implementation and utilization (Ajami & Bagheri-Tadi, 2013).

In Kenya, the Ministry of Health (MoH) has taken up a leading role in implementation of EMR across the country. Kang'a et al. (2016) note that the rollout of electronic medical record systems by Kenya's Ministry of Health has been embraced by healthcare facilities across the country, albeit at a slower rate. Regular improvements to the implementation program aims to accelerate the number of public healthcare facilities using EMR for the overall improvement of healthcare quality.

1.1 Problem statement

In Kenya, comprehensive care centres (CCCs) play a crucial role in providing integrated care for various health conditions, including HIV/AIDS. However, there is limited research on the utilization of EMRs by doctors and clinical officers within CCCs in Nairobi City County. The problem lies in the potential underutilization or

inefficient use of EMRs, which may hinder the realization of the full benefits of digital health technologies in improving patient care and health system efficiency in this specific setting. The benefits of EMR interventions in healthcare are well-documented in previous studies, demonstrating that its use is crucial not only for streamlining and integrating key healthcare processes but also for reducing operational costs, which ultimately affects the fees patients pay for medical services. Ongarora et al. (2019) noted that Nairobi County has experienced significant population growth, with a large portion of the population residing in informal and semi-formal settlements where healthcare services are limited. While the national and Nairobi County governments have increased their efforts to expand healthcare facilities across the county to meet rising demand, the growing number of patients against the limited facilities has made it challenging to deliver quality care. Data complexity due to inadequate technological infrastructure has further complicated the improvement of healthcare services. More than ever, the healthcare sector urgently needs an EMR system to ensure overall improvements. In light of this, the study aims to investigate the various challenges hindering the implementation and use of EMR in CCCs across Nairobi, with the goal of proposing suitable interventions to accelerate EMR adoption and utilization.

1.2 Study Justification

Many Comprehensive Care Centers are currently in the process of implementation of digitization of patient records. The introduction of electronic medical records has in some instances failed due to institutional factors rather than due to factors related to system efficiency (Kuhn et al, 2001). The findings of the current study may inform the County health management and implementers on challenges during the process of

EMR implementation identified by the stakeholders (CCC management, clinicians, data personnel and grant implementers) as well as provide comparison of patient outcomes before and after the implementation of EMR as defined by various indicators.

In addition, this study may inform health care delivery teams on gaps identified in patient management which will provide evidence based guidance during creation of standard operating procedures and implementation of interventions. This study may attempt to fill this knowledge gap through use of HIV quality of care indicators to clearly elucidate the impact of electronic medical records in health care provision. This study may provide a framework for utilization of EMR to the rest of the hospital's in the County who have not installed EMR's yet.

1.3 Study objectives

1.3.1 Broad objective

To assess the utilization of electronic medical records by doctors and clinical officers in comprehensive care centres in Nairobi City County, Kenya.

1.3.2 Specific Objectives

i. To establish the technological factors influencing the adoption and utilization of EMR systems by healthcare providers in CCCs in Nairobi City County.
ii. To examine the organizational factors affecting the utilization of EMR by doctors and clinical officers in CCCs in Nairobi City County.
iii. To establish time and individual factors affecting the utilization of EMR by doctors and clinical officers in CCCs in Nairobi City County.

1.3.3 Research questions

i. What are the technological factors affecting the adoption and utilization of EMR systems by healthcare providers in CCCs in Nairobi City County?

ii. What are the organizational factors affecting the utilization of EMR by doctors and clinical officers in CCCs in Nairobi City County?

iii. To what extent does the time and individual factors affect the utilization of EMR by doctors and clinical officers in CCCs in Nairobi City County?

1.3.4 Hypothesis

Organizational, technological, time and individual factors that influenced EMR utilization were not significantly associated with EMR utilization levels in services offered by HIV and AIDS CCC in Nairobi City County.

1.4 Significance and Anticipated Output

The study is anticipated to confirm improvements in quality of care indicators at CCCs in Nairobi County. It is expected to provide insights into user acceptability of electronic medical records within larger hospitals. Additionally, the study will identify barriers to anticipate during EMR implementation. Finally, it will evaluate the effectiveness of EMR as a clinical decision support tool by assessing its ability to monitor and enhance the quality of care within CCCs and similar healthcare facilities.

1.5 Theoretical and Conceptual framework

This study was guided by four key theories that are essential for understanding the various factors influencing the adoption and implementation of EMR in healthcare. These theories are the Diffusion of Innovation Theory (DIT), the Theory of Reasoned Action (TRA), the Theory of Interpersonal Behavior (TIB), and the Technology Acceptance Model (TAM).

1.5.1 Diffusion of innovation theory

Developed by American sociologist Everett Rogers in 1962, the Diffusion of Innovation Theory aims to explain how innovative ideas spread from a central source to individuals within a given environment (Wani & Ali, 2015). Rogers highlighted that key elements, such as the invention of the innovation, effective communication channels, a defined time period, and a functioning social system, are essential for the successful dissemination of new ideas. According to Dibra (2015), Rogers also emphasized that the innovative capabilities of individuals in a given environment are crucial not only for generating new ideas but also for ensuring their long-term sustainability. While this theory is often applied to foster innovation in business organizations, it can also be used to understand how technology can be effectively integrated and utilized in healthcare. In the context of this study, fostering high levels of creativity and innovation is vital for the successful implementation of EMR systems in healthcare facilities across Nairobi. Therefore, innovative ideas should be initiated by leadership and communicated effectively to other healthcare professionals for successful implementation and use. Leaders in Kenya's healthcare sector must create the right conditions to support the implementation and sustainability of these innovative ideas.

1.5.2 Theory of reasoned action and planned behavior

The Theory of Reasoned Action, developed by Fishbein and Ajzen in 1975, examines human behavior through two key variables: attitude and subjective norms (Fishbein et al., 1975). According to Staats (2004), Fishbein and Ajzen posited that human behavior is significantly influenced by these variables. Attitude refers to an individual's general feeling, either positive or negative, toward a particular objective. Essentially, attitude reflects how an individual perceives the feasibility of achieving a

given goal under current circumstances. Subjective norms, on the other hand, pertain to an individual's perception of social pressures related to the objective.

The Theory of Planned Behavior, which builds upon the Theory of Reasoned Action, similarly asserts that human behavior is under voluntary control (Staats, 2004). This theory suggests that an individual's willingness to act influences their ability to successfully execute a given goal (Ajzen, 1985; 1991). In the context of this study, these theories are relevant as they can be applied to shape the attitudes of healthcare employees toward the implementation of EMR systems. One significant challenge to the successful implementation of EMR in Kenya is the attitude of employees towards the proposed changes. By understanding these attitudes, policymakers can develop and implement effective strategies to encourage EMR adoption and sustain its use.

1.5.3 Theory of interpersonal behavior

The Theory of Interpersonal Behavior also provide insights into EMR acceptance among healthcare employees. Developed by Harry Triandis in 1977, this theory is similar to the intention-behavior theories discussed earlier, as it also identifies psychological components that influence human behavior (Robinson, 2010). However, Triandis emphasized three key factors as direct determinants of behavior: intention, facilitating conditions, and habit. Triandis recognized the crucial role of the social environment in shaping individuals' intentions toward specific objectives. He also highlighted the importance of facilitating conditions within the environment and an individual's past behavior in establishing routine practices.

In the context of this study, the Theory of Interpersonal Behavior is valuable for understanding how the social environment can support the implementation of EMR in CCCs across Nairobi County. Creating an environment that enables healthcare

workers to interact regularly with the EMR system is essential for establishing a routine that promotes the long-term use of this technology in healthcare.

1.5.4 Technology acceptance model

The Technology Acceptance Model, developed by Fred Davis in 1986, posits that two key factors determine whether a new technology will be accepted and used by its intended users: perceived usefulness and perceived ease of use (Davis, 1985). According to Davis, if users do not perceive a technology as both useful and easy to use, it is unlikely to be adopted, regardless of the creator's intentions or the technology's actual capabilities (Silva, 2015). In other words, even if a technology is designed to be user-friendly and beneficial, it will not be accepted if the target users do not share this belief.

This theory highlights the importance of designing technology that addresses real challenges while also being user-friendly. In the context of this study, previous research has identified strong resistance from healthcare employees as a major barrier to EMR implementation. This resistance may stem from either a lack of technical skills among employees or a perception that the EMR system is not useful. Given the demonstrated benefits of EMR systems worldwide, it is crucial for the government to ensure that healthcare employees are adequately trained to operate within the EMR framework, thereby facilitating its successful implementation.

While all the theories discussed under this section are relevant to the study, Fred Davis’s Technology Acceptance Model will guide the study as it aims to establish the various factors that influence EMR implementation and utilization in CCCs within Nairobi County.

1.6 Conceptual framework

In the context of the utilization of electronic medical records (EMR) by doctors and clinical officers in comprehensive care centers (CCC), various independent variables play a crucial role in influencing the successful implementation and utilization of EMR systems. These variables include Organizational Factors, Technological Factors, Individual Factors, and Time Factors, all of which are interrelated and contribute to the effectiveness of EMR adoption.

Independent Variables

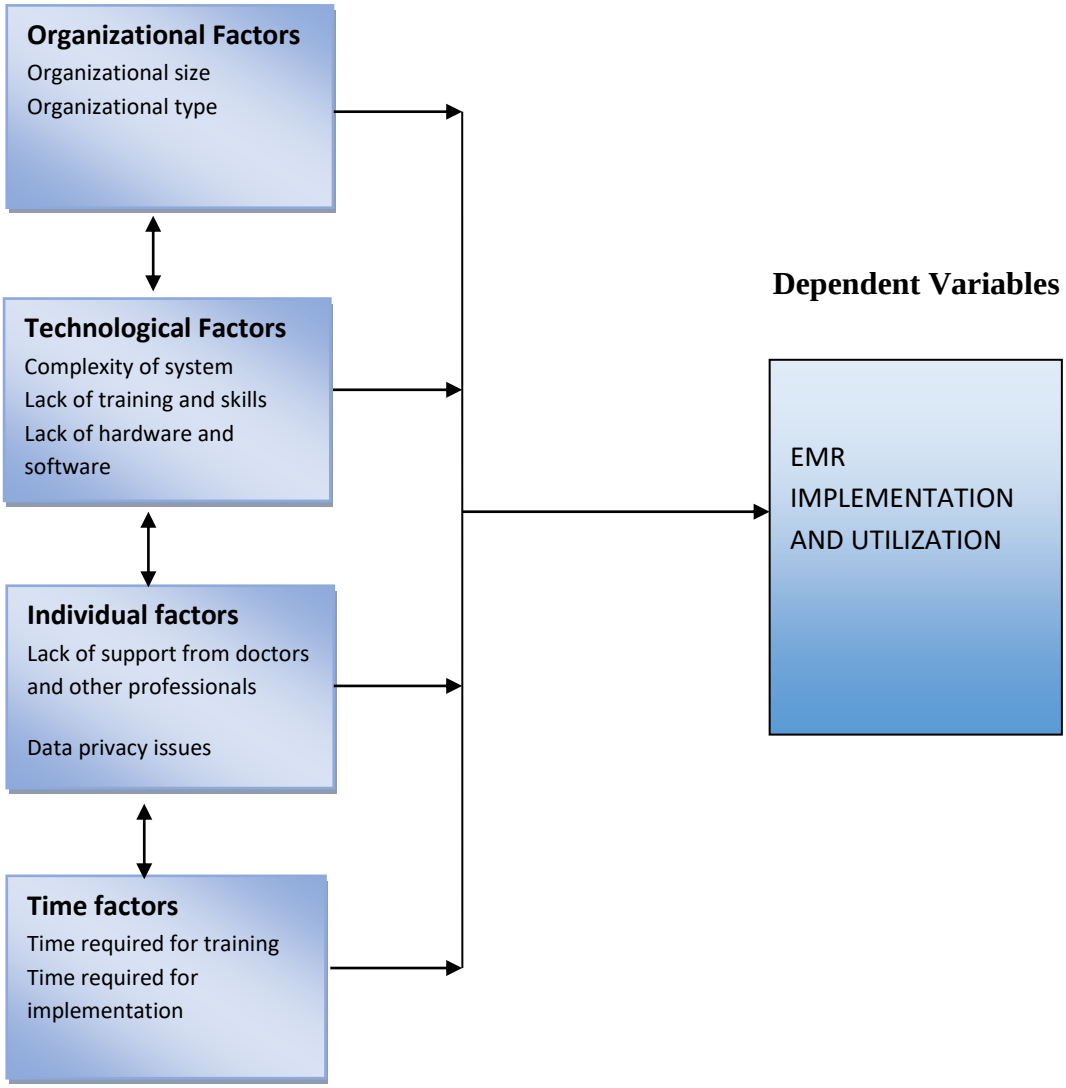

Figure 1.1 Conceptual Framework
Adopted from Boonstra and Broekhuis (2010)

Organizational factors such as organizational size and type significantly impact EMR implementation and utilization. Larger organizations often have more resources, including financial, human, and technological, which can facilitate the adoption of EMR systems. Conversely, smaller organizations may face constraints in budget and staff, making it more challenging to implement complex technologies like EMR. Additionally, the type of organization, whether public or private, influences the adoption process. Private organizations might have more flexibility in decision-making and the ability to allocate resources towards technology adoption, while public organizations may encounter bureaucratic hurdles and slower decision-making processes.

Technological factors are critical in determining the ease with which EMR systems are implemented and utilized. The complexity of the EMR system can pose challenges; if the system is perceived as overly complicated, it may deter users from fully engaging with it. A lack of training and skills among healthcare professionals further exacerbates this issue, as they may struggle to navigate and utilize the system effectively. Moreover, the absence of adequate hardware and software infrastructure can impede the smooth operation of EMR systems, leading to underutilization and inefficiencies in patient care.

Individual factors such as support from doctors and other healthcare professionals, and concerns over data privacy, also play a significant role. The successful implementation of EMR systems relies heavily on the buy-in from key stakeholders, particularly doctors and clinical officers who are the primary users of these systems. If these professionals do not support the transition to EMR or feel that their workflows are disrupted, the adoption process can be hindered. Additionally, data privacy issues are a significant concern, especially in healthcare settings where sensitive patient

information is involved. If healthcare professionals perceive the EMR system as lacking robust data security measures, they may resist its use, fearing potential breaches of patient confidentiality.

Time factors are another crucial consideration, including the time required for training and the time needed for full implementation. EMR systems require adequate training to ensure that healthcare professionals are comfortable and proficient in using the technology. Insufficient training time can lead to poor system utilization, as users may not fully understand how to operate the system or leverage its capabilities. Similarly, the overall time required for implementing EMR systems can affect adoption rates. A prolonged implementation period may cause disruptions in routine operations, leading to resistance from staff who may be wary of the changes and challenges associated with transitioning to a new system.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Most CCC in the County which previously used paper based systems, are currently implementing electronic medical records (EMR). This study evaluated the utilization of the EMR by end users, challenges and benefits realized and how the utilization has improved the quality of care to the patient.

Few empirical studies have been carried out to determine EMR utilization levels of patients and health workers and effectiveness of the same on service delivery. Moreover, the body of knowledge regarding EMR in HIV and AIDS CCC services is generally lacking and no adequate systematic compilation of information for reference or knowledge transfer exists. There is a gap in knowledge regarding the situation of EMR application in HIV and AIDS CCC services with a view of improving quality of services offered. The factors that influence EMR utilization, interventions and strategies of adopting and actually applying technology need to be understood.

2.2 Benefits of EMR in Healthcare

As highlighted earlier, there are several proven benefits that hospitals and healthcare practitioners can enjoy by using EMR. The global shift towards technology has mandated the healthcare sector to adopt use of technology as a compliance to the changing social environment. Several studies have investigated the various benefits that can accrue to healthcare facilities through implementation of technological platforms such as EMR. For instance, Reis et al. (2017) conducted a comparative study using the blueprint for implementation of EMR to investigate the potential benefits that hospitals can enjoy if they implement EMR within their operational framework. The results of the analysis revealed that through implementation of EMR, hospitals would reduce the workload that accumulates to clinicians significantly.

Also, the EMR system was found to be highly effective in eliminating medical errors that may sometimes result in casualties. The researchers attribute these results to the high levels of efficiency associated with the EMR system which includes automatic collection and storage of medical data, alerts that serve the important function of reminding healthcare providers when certain intervention measures of screening procedures are due or out of date and overall improvement of healthcare quality. In a similar study, Fritz et al. (2015) conducted a systematic review that aimed to clearly establish the impact that EMR has had in healthcare. The articles analyzed in the review were sourced from various medical electronic databases which include MEDLINE, PubMed, CINAHL, COMPENDEX and Academic Search Premier. The results of the review established that while there hospitals, particularly in developing countries are still facing major challenges with the implementation of EMR, several benefits including enhancement of healthcare quality and delivery and improved decision making process had accrued to hospitals with EMR. The improvements observed in the decision making process were attributed to availability of accurate and reliable medical data.

The benefits of EMR have also been observed in hospitals in Kenya where the technology has been adopted. A study conducted by Sumbi (2016) at the Coast General Hospital involving 141 employees revealed a multitude of benefits that include enhanced efficiency and collaboration among healthcare personnel at the hospital. Essentially, EMR enabled collaboration of important healthcare personnel such as doctors and nurses for the overall delivery of quality healthcare services. In another study, Waithera et al. (2017) conducted a cross-sectional qualitative study to determine how implementation of EMR at the Kisii Teaching and Referral Hospital had impacted service delivery. Drawing on data from healthcare practitioners at the

hospital and neighboring healthcare facilities, the findings of the study revealed that implementation of EMR at the hospital has had significant positive impact within and outside the facility. For instance, the practitioners interviewed expressed that they had observed enhanced productivity and collaboration among hospitals and staff as opposed to when the hospital was reliant entirely on manual platforms to record and store data. In Kisumu, a study conducted by Oluoch et al. (2020) which collected and analyzed data from 173 participants revealed that implementation of EMR has enhanced the fight against HIV/AIDS. Through EMR, hospitals are able to keep accurate records of patients, their prescriptions and general health condition. While the studies discussed above have highlighted the various benefits that have accrued to hospitals through implementation of EMR, there are several challenges that must be overcome to facilitate smooth implementation of this technology.

2.3 Technological factors affecting the adoption and utilization of EMR systems

In the United States, a study by Kruse et al. (2016) employed a mixed-methods research design to explore the technological barriers and facilitators of EMR adoption in healthcare facilities, including comprehensive care centres. The study utilized surveys and semi-structured interviews as data collection instruments, gathering insights from healthcare providers and IT professionals. The findings highlighted that interoperability issues, the complexity of the systems, and the need for user-friendly interfaces were significant factors affecting EMR adoption. Additionally, robust IT infrastructure and technical support were identified as crucial for successful implementation. However, the study was limited by its focus on larger healthcare facilities, leaving a gap in understanding the experiences of smaller or rural centres.

In Bangladesh, a study by Islam et al. (2017) used a quantitative research design to assess the technological factors influencing the adoption of EMR systems in comprehensive care centres. The researchers conducted surveys with healthcare professionals across several centres to identify key technological challenges. The findings revealed that limited access to high-speed internet, insufficient training on EMR systems, and concerns about data security were significant barriers to adoption. The study also found that the lack of government support and standardization of EMR systems hindered widespread adoption. However, the study's narrow focus on a few urban centres limited the generalizability of the findings to rural areas.

Pare et al. (2014) adopted a mixed methodology and a Delphi study design to explore the various challenges that face the implementation of EMR in hospitals in Canada. The researchers recruited 21 healthcare professionals who were required to engage in a roundtable discussion on the various challenges that hospitals face when implementing EMR. Additionally, the researchers also engaged 431 participants through online questionnaires. The data collected from the 21 professionals and the 531 survey responses were analyzed qualitatively and quantitatively. The results of both qualitative and quantitative analysis revealed deep-seated financial and technical challenges that hospitals face as they strive to adopt EMR. It was observed that hospitals mainly face the dilemma of investing heavily in EMR technology with no assurance that the investment will generate returns. Khalifa (2013) similarly demonstrated that financial and technical factors were the main barriers that hospitals in Saudi Arabia faced in their bid to implement EMR as part of improving quality of healthcare delivery. Technical barriers exist because of severe shortage of medical personnel who can implement the EMR system flawlessly. Any efforts to overcome

the technical barrier have been heavily set back by the high costs of securing quality training.

In Ghana, Boateng et al. (2020) conducted a qualitative study to explore the technological factors affecting EMR utilization in comprehensive care centres. Using focus group discussions and in-depth interviews, the study gathered data from healthcare providers, IT staff, and patients. The findings indicated that inadequate infrastructure, such as unreliable electricity and internet connectivity, was a major barrier to EMR adoption. Additionally, the lack of locally relevant software and inadequate technical support were highlighted as significant challenges. Despite these insights, the study did not quantify the impact of these factors, leaving a gap in understanding their relative importance.

In Nigeria, a study by Akande and Adeyemi (2019) utilized a case study approach to investigate the technological challenges of EMR adoption in comprehensive care centres. The study used a combination of surveys and interviews to collect data from healthcare workers and IT personnel. The results showed that high initial costs, lack of standardized systems, and insufficient technical training were key factors hindering EMR adoption. The study also identified a significant gap in continuous technical support, which affected the long-term utilization of EMR systems. However, the study's focus on a single comprehensive care centre limits the ability to generalize the findings across different settings in Nigeria.

A study conducted by Sumbi (2016) revealed a multitude of benefits that have accrued to hospitals that have implemented the EMR system in Kenya, the researcher also outlined a number of challenges that have slowed the process of implementation and utilization of the said technology. For instance, financial and technical constraints

at the Coast General Hospital means that the EMR system cannot be rolled out on a large scale. Only a limited number of employees at the hospital are adequately equipped with the technological capability to operate with an EMR system. This condition is exacerbated by the fact the hospital is financed fully by the Country government which has limited resources. In a similar study, Chebole (2015) revealed in her findings that healthcare practitioners in Nakuru were limited in their ability to use technology when executing their day to day activities. In particular, poor access to the internet, lack of technical ability and user perception of the usefulness of EMR, especially given the cost implications associated with implementation of EMR were cited as the main limitations.

In Kenya, Otieno et al. (2018) conducted a descriptive study to examine the technological factors influencing the adoption of EMR systems in comprehensive care centres. The study employed surveys and focus group discussions as data collection instruments, targeting healthcare workers and IT specialists in multiple centres. The findings highlighted that while there was a growing awareness of the benefits of EMR systems, challenges such as inadequate IT infrastructure, lack of integration with existing systems, and concerns over data privacy were significant barriers to adoption. The study also pointed out that there was a lack of user involvement in the design and implementation of EMR systems, which affected their usability and acceptance. However, the study's descriptive nature meant that it could not establish causal relationships between the technological factors and EMR adoption outcomes.

2.4 Organizational factors affecting the utilization of EMR system

In Canada, a study by Ludwick and Doucette (2009) employed a mixed-methods research design to investigate the organizational barriers and facilitators to EMR

adoption in healthcare facilities, including comprehensive care centres. The study used surveys and in-depth interviews as primary data collection instruments, targeting healthcare administrators and IT managers. The findings revealed that leadership support, organizational culture, and the availability of resources were critical factors influencing EMR adoption. Facilities with strong leadership and a culture supportive of technological innovation were more likely to successfully implement EMR systems. However, the study also noted that resistance to change and a lack of alignment between the EMR system and existing workflows were significant challenges. One gap in this study was its limited focus on the long-term sustainability of EMR systems after initial adoption.

In Pakistan, a study by Shaikh et al. (2019) utilized a quantitative research design to assess the organizational factors affecting EMR utilization in comprehensive care centres. Surveys were distributed to healthcare professionals and administrators across several centres to gather data on the factors influencing EMR adoption. The findings indicated that inadequate training, poor management support, and a lack of strategic planning were key barriers to EMR utilization. The study also highlighted that many healthcare facilities lacked a clear vision for integrating EMR systems into their operations, which hampered their effective use. However, the study was limited by its reliance on self-reported data, which may have introduced bias in the findings.

In India, Bansal et al. (2020) conducted a study using a cross-sectional research design to explore the organizational challenges in adopting EMR systems in comprehensive care centres. The researchers employed structured questionnaires to collect data from healthcare workers, administrators, and IT staff. The findings showed that a lack of organizational commitment, inadequate financial resources, and insufficient staff training were significant factors hindering EMR adoption. The study

also found that the hierarchical nature of Indian healthcare organizations often slowed down decision-making processes related to EMR implementation. However, the study did not examine the role of external factors, such as government policies and regulations, which could also influence EMR adoption.

In Nigeria, a study by Adebayo et al. (2017) used a case study approach to investigate the organizational factors influencing EMR adoption in comprehensive care centres. The study utilized a combination of surveys and focus group discussions to collect data from healthcare professionals and administrators. The results indicated that organizational readiness, including the availability of necessary infrastructure and staff willingness to embrace new technology, was crucial for successful EMR adoption. The study also identified challenges such as limited financial resources, inadequate training, and resistance to change among staff. However, the study was limited by its focus on only a few centres, which may not fully represent the broader context of EMR adoption in Nigeria.

In Tanzania, Mlay et al. (2015) conducted a qualitative study to explore the organizational factors affecting the utilization of EMR systems in comprehensive care centres. The study used interviews and focus group discussions to gather insights from healthcare providers and administrators. The findings revealed that supportive leadership, continuous training, and the alignment of EMR systems with organizational goals were key facilitators of EMR utilization. However, the study also noted that the lack of a robust change management strategy and limited financial resources were significant barriers. The study's qualitative nature, while providing in-depth insights, did not allow for the generalization of findings across different healthcare settings in Tanzania.

In Kenya, a study by Were et al. (2019) employed a descriptive research design to examine the organizational factors influencing EMR adoption in comprehensive care centres. The study used surveys and interviews to collect data from healthcare workers, administrators, and IT staff. The findings indicated that organizational culture, management support, and the availability of resources were critical factors in EMR adoption. The study also highlighted the importance of involving end-users in the design and implementation process to ensure the system meets their needs. However, the study did not explore the impact of external factors, such as regulatory frameworks and funding, on EMR adoption, leaving a gap in understanding the full range of influences.

2.5 Time and individual factors affecting the utilization of EMR system

In the United States, a study by McAlearney et al. (2015) employed a mixed-methods research design to explore how time constraints and individual characteristics of healthcare providers influence the adoption of EMR systems in comprehensive care centres. The study used surveys and semi-structured interviews to gather data from physicians and nurses. The findings revealed that time pressure, perceived ease of use, and computer literacy were significant individual factors impacting EMR adoption. Providers with higher computer literacy and positive attitudes toward technology were more likely to adopt EMR systems despite time constraints. However, the study identified a gap in understanding the long-term impact of these individual factors on sustained EMR utilization, suggesting a need for longitudinal studies.

In Canada, a study by Gagnon et al. (2014) utilized a cross-sectional research design to assess the impact of individual and time-related factors on EMR utilization in comprehensive care centres. The researchers administered surveys to healthcare

providers across multiple centres to measure their attitudes, training, and perceived time available for EMR usage. The study found that lack of time for proper training and ongoing support significantly hindered EMR adoption. Additionally, the study noted that individual factors such as age, experience, and willingness to learn new technologies played a crucial role in EMR acceptance. One of the study gaps identified was the need for further research into how these factors interact with organizational support to influence EMR adoption.

In India, Prakash and Chauhan (2019) conducted a quantitative study using surveys to examine the influence of individual factors, such as age, experience, and perceived usefulness, on EMR adoption in comprehensive care centres. The study found that younger healthcare providers and those with more experience using technology were more likely to adopt EMR systems. However, time-related factors such as the perceived time required to learn and use EMRs were barriers to adoption. The study suggested that insufficient training and support could exacerbate these barriers, highlighting a gap in understanding the role of continuous education and support in mitigating time-related challenges.

In Nigeria, a study by Fadare et al. (2018) employed a qualitative research design to explore the time and individual factors affecting EMR utilization in comprehensive care centres. The study used in-depth interviews with healthcare providers to gather insights into their experiences with EMR systems. The findings indicated that individual factors such as resistance to change, low computer literacy, and fear of technology were significant barriers to EMR adoption. Time-related factors, including the perceived time burden of EMR usage and inadequate time for training, also hindered adoption. The study highlighted the need for tailored training programs to

address these individual barriers but lacked quantitative data to measure the impact of these factors on EMR utilization.

In Tanzania, a study by Mikkelsen and Aas (2018) used a mixed-methods approach to investigate how time and individual factors influence EMR adoption in comprehensive care centres. The study utilized surveys and focus group discussions with healthcare workers to explore their perceptions of EMR systems. The findings revealed that healthcare providers often felt that EMR systems added to their workload, leading to resistance in adoption. Additionally, individual factors such as age, computer literacy, and previous experience with EMRs significantly influenced their willingness to adopt the systems. The study identified a gap in exploring how these individual factors evolve over time and affect the long-term sustainability of EMR usage.

In Kenya, a study by Wambugu et al. (2017) employed a descriptive research design to examine the role of time and individual factors in EMR adoption in comprehensive care centres. The study used questionnaires and interviews to collect data from healthcare providers. The findings indicated that time constraints, such as insufficient time for training and perceived time required for EMR usage, were major barriers to adoption. Additionally, individual factors such as education level, familiarity with technology, and attitudes toward change played a significant role in influencing EMR adoption. The study suggested that more research is needed to understand how continuous support and time management strategies can alleviate these barriers.

In relation to time as a barrier, Jimma and Enyew (2022) explained that there are several time factors that influence the implementation of EMR in hospitals. The study revealed that factors such as limited time for training and implementation act as

barriers to EMR implementation. Essentially, changing to a completely different system requires extended time periods that is not available considering service provision in the healthcare sector cannot be halted. Furthermore, the time required to transfer all the patient data from the manually kept records to the automated EMR records must be backed with huge amounts of financial resources. Furthermore, Slaughter (2017) explains further that the time required to train all healthcare professionals within the respective hospital that requires transition from manual to EMR recording makes it difficult for EMR to become a viable option for consideration. Essentially, it requires high levels of manpower to successfully train all staff in a hospital that will use the EMR system regularly. Overall, the findings analyzed in this section reveal the difficulties that hospitals, especially in developing countries face in their effort to transition from manual records to the more efficient EMR.

A study conducted by Msiska et al. (2017) revealed that while gender differences had no impact on EMR implementation and use, age played an importance in EMR user acceptance level. Older users were associated with higher levels of resistance while younger users appeared to be more receptive towards EMR implementation and use. In a similar study, Handayani et al. (2018) established that in addition to age, education level also played a critical role in EMR user acceptance. Like age, those with higher levels of education were more receptive towards EMR implementation and use while those with low education qualifications were less supportive.

2.6 Summary of Literature Review

The reviewed studies reveal that the global healthcare sector has made significant strides in integrating technology, with Electronic Medical Records (EMRs) emerging as a prominent tool adopted by hospitals worldwide to enhance service delivery. Research by Sumbi (2016) and Waithera et al. (2017) highlights the benefits that hospitals can gain from incorporating EMRs into their operations. However, despite substantial evidence supporting the advantages of EMRs, their implementation and utilization, particularly in developing countries, remains sluggish. Studies by Pare et al. (2014), Sumbi (2016), and Khalifa (2013) identify financial, social, and technical barriers as key obstacles hindering the adoption of EMRs in these regions. There is limited research on overcoming these barriers. This study aims to address these gaps by examining the factors contributing to these challenges and exploring potential solutions within the context of the Kenyan healthcare sector.

2.7 Research Gap

Although the several studies discussed above discuss and document findings on the barriers to EMR implementation, only a few have focused on EMR implementation in small clinics or comprehensive care clinics that are constrained of resources. Limited research on how the utilization of EMRs varies across different regions and specific CCCs within Kenya. However, there is need to have a study that provide a comprehensive analysis of regional disparities in EMR utilization, including how local factors such as infrastructure and resource availability affect implementation. As Jawhari et al. (2016) explain, small size health facilities experience unique challenges that are not common in large facilities and thus, EMR implementation in these facilities must be investigated within the prevailing circumstances present within the facilities. In this respect, a limited number of studies have looked at EMR

implementation by users in comprehensive care clinics. Thus, this study aims to fill this gap by focusing on CCCs within Nairobi County.

CHAPTER THREE: MATERIALS AND METHODS

3.0 Introduction

This chapter the research methodology adopted for this study. In particular, various elements of research methodology such as the study design, variables, location, sampling, data collection and analysis techniques as well as the ethical considerations made by the researcher are discussed.

3.1 Study design

A quantitative research approach was adopted for this study alongside a descriptive cross-sectional survey design. According to Gay (1981), a survey is defined a process of collecting data from members of a particular population in order to investigate the relationship between two variables. Cross-sectional survey design was adopted because it provides a suitable platform which a researcher can use to collect data from a large sample within a short period of time (Miller, 1991). The descriptive design adopted was also suitable because as explained by Mugenda et al. (2003), it investigates a research phenomenon by focusing on the perceptions of the people involved. In this case, the researcher aims to investigate and establish the various factors that inhibit implementation of EMR in CCCs in Nairobi and propose suitable intervention measures that can be used to address the identified challenges.

3.2.1 Independent variables

The study considered independent variables which were: Organizational, technological, time and individual factors influencing EMR utilization by doctors and clinical officers

The independent variables were measured using the Likert scale. As Batterton (2017) explains, Likert scales are used to measure respondents' attitude towards a given

statement. In this case, scales with scores ranging from1 to 5 were used to measure the extent to which respondents agreed with a given statement in relation to implementation and use of EMR in CCCs within Nairobi County (see appendix II for scale and questions).

3.2.2 Dependent variable

The dependent variable was EMR utilization.

3.3 Location

The study was conducted in Nairobi City County. It borders Kiambu County to the North and West, Kajiado to the South and Machakos to the East. Among the three neighbouring counties, Kiambu County shares the longest boundary with Nairobi County. The County has a total area of 696.1 Km^2 and is located between longitudes 36o 45’ East and latitudes 1o 18’ South. It lies at an altitude of 1,798 metres above sea level. The county has a population of 4,397,073 people as per the 2019 Kenya Population and Housing Census with 2,192,452 (49.9%) being male, 2,204,376 (50.1%) being female and 245 (0.006%) being intersex. The county had 1,506,888 households and an average household size of 2.9.

According to KAIS (2012), Nairobi County has 155 HIV and AIDS Comprehensive Care Centers. One Hundred (100) of them are private while fifty-five (55) are public. They are distributed across the eight administrative Divisions. Central Division has 22, Dagorreti 25, Embakasi 20, Kasarani 22, Kibera 15, Makadara 17, Pumwani 16 and Westlands 18. In regard to EMR, the County has the highest concentration and also the highest (70%) population which is EMR literate (CCK, 2011).

3.4 Study Population

The study population included doctors and clinical officers who serve in the CCC and use on a frequent basis the EMRs in place. Participants for the study were doctors and

clinical officers who work in the HIV and AIDS Comprehensive Care Centres in Nairobi County, aged above 18 years and willing to participate. The study targeted 2,200 healthcare workers (doctors and clinical officers) practicing in Nairobi City County (Kenya Medical Practitioners and Dentists Council (KMPDC), 2022). The target population was Doctors and clinical officers who did not consent and those who had not used the EMR for more than three months were excluded

3.5 Sampling Techniques and Sample Size

3.5.1 Sampling Techniques

Purposive sampling is particularly suited for this study because it targets a distinct group of professionals; doctors and clinical officers who are directly involved with the implementation and utilization of EMR systems in CCCs. This technique ensures that the sample comprises individuals who have firsthand experience and knowledge of the challenges and benefits associated with EMR utilization. In this case, Nairobi County was selected for a number of reasons which include its high rate of HIV/AIDS prevalence in the country, its advanced technological infrastructure and its complex population which corresponds with the research phenomenon under investigation.

3.5.2 Comprehensive Care Centers

Although the study location was selected using purposive sampling, the comprehensive care centres (CCCs) within this location were sampled using a stratified random sampling strategy. This approach included both public and private facilities. All CCCs with electronic medical records (EMRs) in both public and private hospitals were incorporated into the study. This was done to ensure a diverse range of characteristics, particularly in terms of socio-economic backgrounds.

3.5.3 Primary Respondents

For the purposes of this study, doctors and clinical officers were purposefully selected as the primary respondents. As noted by Theofanidis and Fountouki (2018), a random sampling technique is most applicable in studies where the research phenomenon affects individuals uniformly, enabling each person to contribute relevant data. However, in this case, the researcher recognizes that only a specific minority group possesses the requisite qualifications to provide insights into the challenges associated with EMR implementation in hospitals across Nairobi. Therefore, participant recruitment was specifically targeted to the identified facilities.

3.5.4 Sample Size Determination

The sample size is computed as follows using Fisher *et al.* (2008) formula for sample calculation symbolized by the following function:

$$N = \frac{Z^2 p.q.\ D}{d^2}$$

N = Sample size

Z = Standard normal deviation (1.96) which corresponds to 95% confidence interval.

P = Proportion of occurrence of the variable of focus (which is 0.5 where the figure is not known).

Q =The proportion of non-occurrence of the variable of focus (which is I- P =0.5)

D = Degree of accuracy = 0.05

D= Design effect (which is 1for homogenous population)

The calculation:

$$n = \frac{(1.82)^2 x\ 0.5\ x\ 0.5\ x\ 1}{(0.0025)} = 332$$

Since the estimate population of health facility in charges and health records and information officers was less than 10,000, the following formula was used.

$$nf = \frac{n}{1 + (\frac{n}{N})}$$

Where:

nf = the desired sample size (when the population is less than 10,000)

n = the desired sample size (when the population is more than 10,000)

N = the estimate of the population size

Therefore, the final sample size was calculated as follows:

Final Sample size=332/ (1+ (332/250)) =144

The final number of participants adopted was 100 as it was considered sufficient to gain a variety of perspectives while maintaining control at the same time.

3.6 Data Collection Tools

Questionnaires with questions relevant to the study were used to collect the data analyzed in this study. Questionnaires designed for this study typically include a mix of closed-ended and open-ended questions. Closed-ended questions allow for the collection of standardized data, making it easier to quantify and analyze trends in EMR utilization. Open-ended questions, on the other hand, provide respondents with the opportunity to express their experiences, challenges, and suggestions regarding EMR usage, offering deeper insights into individual and contextual factors affecting utilization.

3.7 Validity and Reliability of Data Collection Tools

To ensure data quality, a number of control measures were adopted. According to Cohen et al. (2017), data quality control in research is important as it ensures high levels of accuracy, reliability and validity in the findings documented. Data quality control basically involves a set of specific measures and controls aimed at ensuring accuracy and consistency. In this case, the researcher guaranteed the accuracy of the

data used through a set of measures such as data randomness. While the sampling technique was purposive in relation to the targeted population, sample selection with regards to the final participants was random. Additionally, the researcher thoroughly reviewed all the data collection forms to ensure appropriate and correct data entry. Other data quality control measures adopted include pretesting of data collection tools to ensure that problems associated with the tools used were identified and rectified well in advance.

3.8 Pre-testing of Data Collection Tools

In this case, pre-testing was conducted using 5 random volunteers within the school. The volunteers were given the same questionnaires that would be handed over to the participants and asked to respond. This helps in identifying any ambiguous questions and ensures that the language and content are appropriate for the target population. The questionnaires should also be designed to minimize bias, with clear and neutral wording that does not lead respondents toward a particular answer.

3.9 Data analysis

Data were sorted out, coded and summarized for easy analysis. Both qualitative and quantitative data were collected. Qualitative data were organized according to the objectives that guide the study. Themes were formed on the bases of analysis. Quantitative data were analyzed descriptively and inferentially with the aid of Statistical Package for Social Science (SPSS v. 21). The descriptive statistics include frequency tables, percentages, mean and standard deviation. Analysis of variance analysis was used to test the relationship between the independent and dependent variables.

3.10 Ethical considerations

Given that this study involves collecting and analyzing data from human subjects, the researcher took several ethical measures to ensure participant safety. Personal identifiers, such as ID numbers and names, were not collected; instead, unique numbers were assigned to label and identify participants throughout the study. All participants were required to sign consent forms, which indicated that their participation was voluntary. These consent forms provided a concise but thorough overview of the research objectives and outlined how the collected data would be used, allowing participants to make informed decisions.

In addition to obtaining informed consent, the researcher ensured privacy and confidentiality for the participants. According to Ames et al. (2019), although confidentiality and privacy are often used interchangeably, they refer to different concepts in research. Privacy involves granting participants control over the data they choose to provide or withhold. Therefore, participation in answering questions was voluntary, and participants could choose not to answer any question they found too sensitive. Confidentiality, on the other hand, involves measures to protect data from unauthorized access. In this study, data was stored in a password-protected database accessible only to the investigator.

Approval for the study was obtained from the Kenyatta University Graduate School, ethical clearance was secured from the Kenyatta University Ethics Review Committee, and a research permit was granted by the National Council for Science, Technology, and Innovation (NACOSTI) before recruitment and data collection commenced.

CHAPTER FOUR: RESULTS

4.1 Introduction

In this section, findings of the study based on the study topic and guided by the study are presented. The findings touch on the technological factors and EMR utilization, the organizational factors and utilization of EMRs as well as time and individual factors influencing EMR utilization. The results are in the form of frequencies, percentages and inferential statistics and are presented in tables and figures.

4.1.1 Response Rate

The researcher dispatched 144 questionnaires to the chosen respondents. However, 100 completed questionnaires were received back. This led to a response rate of 69.4%, which is thought to be adequate for the research. According to Creswell and Creswell (2017), 50 per cent rate of response is satisfactory, 60 per cent good and above 70 per cent rating better. Zohrabi (2013) stressed that a rate of response accounting for 50 per cent is adequate, while a response rate higher than 70 per cent is very good. The high response rate of the respondents indicated that they were cooperative.

4.2 Distribution of Participants by Demographic Characteristics

The study gathered demographic data from participants on the number of years working at the CCC, gender, age, highest academic level and designation, findings are as presented in table 4.1.

Table 4. 1Distribution of Participants by Demographic Characteristics

		Frequency	Percent
Number of Years working at the CCC	Less than 3 years	23	23.0
	4-6 years	29	29.0
	7-9 years	23	23.0
	10-12 years	25	25.0
Respondent's gender	Male	50	50.0
	Female	50	50.0
Respondent's age	18-20	15	15.0
	21-30	20	20.0
	31-40	20	20.0
	41-50	30	30.0
	51 years and above	15	15.0
Highest academic level	Diploma	18	18.0
	Bachelor	25	25.0
	Master	42	42.0
	PhD/Doctorate	15	15.0
Respondent's designation	Doctor	50	50.0
	Clinical Officers	50	50.0

The results presented in Table 4.1 indicate that 23% of participants had worked at their current CCC for less than 3 years, 29% for 4-6 years, 23% for 7-9 years, and 25% for 10-12 years. This suggests that a slight majority of healthcare workers in CCCs in Nairobi City County have been employed for 4-6 years, with the longest-serving workers having been there for 10-12 years. The results also reveal an equal gender distribution, with 50% of respondents being male and 50% female, ensuring that the findings represent the voices of participants across both genders. Additionally, 15% of respondents were aged 18-20 years, 20% were aged 21-30 years, 20% were aged 31-40 years, 30% were aged 41-50 years, and 15% were aged 51 years and above. Regarding educational qualifications, 18% of participants held diplomas, 25% had bachelor's degrees, 42% had master's degrees, and 15% held doctorate or PhD degrees. This suggests that the majority of healthcare workers in

Nairobi County had attained a master's level education at the time of the study. Lastly, the study found that 50% of participants were doctors and 50% were clinical officers, indicating that the study had an equal representation from both professional categories.

4.3 Health workers EMR adoption

4.3.1 Acceptability of EMR

To investigate the adoption of EMRs by health workers, six specific EMR-related items were purposively selected to assess accessibility. The results presented in Table 4.2 highlight the accessibility of EMRs among health workers. The findings show that EMRs had been installed in all CCCs (100%) in Nairobi County, Kenya. Furthermore, the study revealed that EMRs were being utilized daily by health personnel in every CCC (100%). Additionally, all health professionals (100%) agreed that electronic medical records have helped clinics improve efficiency in service delivery.

4.3.2 Main benefits of Electronic medical records

Table 4.2: Main benefits of Electronic medical records

	Frequency	**Percent**
Able to provide access patient records any time	33	33.0
Able to collect data and review quality performance	48	48.0
Able to create efficiency in the clinic	19	19.0
Total	**100**	**100.0**

As shown in Table 4.2, the primary benefit of EMR adoption in CCCs, as reported by 48% of study participants, was the ability to collect and review quality data. This was followed by the ability to provide access to patient records at any time, which was

noted by 33% of respondents. The least mentioned benefit was the ability to create efficiency in the clinic, cited by 19% of participants.

4.3.3 The main disadvantage of Electronic medical records

Table 4. 3: The main disadvantage of Electronic medical records

	Frequency	Percent
Inability to access patient records during power blackout	26	26.0
Inability to access patient records when internet connection is poor	19	19.0
Low level of computer literacy in staff	18	18.0
Complicated systems requiring high level skills in computer usage	12	12.0
Loss of Jobs in some departments	25	25.0
Total	**100**	**100.0**

The findings from table 4.3 of the study indicate that 26% of health professionals identified the inability to access records during power outages as the primary drawback of utilizing electronic medical records. Additionally, 19% highlighted challenges in accessing patient records when internet connectivity is poor, 18% cited low levels of computer literacy among staff, 12% noted difficulties with complex systems that require advanced computer skills, and 25% expressed concerns about job losses in certain departments due to EMR adoption. These results suggest that despite the implementation of EMR systems by the CCC, various issues have emerged in Nairobi County, Kenya.

4.3.4 Perception of potential personal challenge during the EMR implementation process

Table 4. 4: Experienced challenge during the EMR implementation process

	Frequency	Percent
I am not very conversant with using computers	32	32.0
Patient management will take long due to use of the EMR	24	24.0
Difficulties in accessing patient records	44	44.0
Total	100	100.0

The study results revealed that 32% of health professionals lacked proficiency in using computers, 24% expressed concerns about extended patient management timelines resulting from EMR utilization, and 44% anticipated challenges in accessing patient records due to the CCC's EMR implementations in Nairobi County, as detailed in table 4.4. Consequently, it is evident that health professionals are apprehensive about potential difficulties in retrieving patient records following the CCC's EMR implementation.

4.4 Health Workers perceptions on utilization of EMRs in CCC services

The study sought to answer the question that to what extent does the perception of doctors and clinical officers affect the utilization of EMRs in Nairobi County. Gathered data were analysed and presented in frequencies, percentages and inferential statistics in tables in this section as follows.

4.4.1 Health Workers ratings on utilization of EMRs in CCC services

Table 4. 5: Health Workers ratings on utilization of EMRs in CCC services

	Strongly Agree		**Agree**		**Neutral**		**Disagree**		**Strongly Disagree**	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
Access and speed	46	46.0	30	30.0	9	9.0	6	6.0	9	9.0
Ease of navigation	34	34.0	34	34.0	4	4.0	14	14.0	14	14.0
Efficiency	43	43.0	27	27.0	5	5.0	14	14.0	11	11.0
Personalization	21	21.0	41	41.0	16	16.0	11	11.0	11	11.0
Security/Privacy	39	39.0	36	36.0	0	0.0	12	12.0	13	13.0
User support	25	25.0	34	34.0	10	10.0	14	14.0	17	17.0
Assurance/Trust	69	69.0	31	31.0	0	0.0	0	0.0	0	0.0
User friendly interface	34	34.0	29	29.0	11	11.0	11	11.0	15	15.0
Reliability	36	36.0	23	23.0	18	18.0	10	10.0	13	13.0
Flexibility	32	32.0	19	19.0	0	0.0	17	17.0	32	32.0

The study also established that 46% of respondents strongly agreed that access and speed enhanced utilization of EMRs in CCC services, 30% agreed, 9% were neutral, 6% disagreed and 9% strongly disagreed. It was also shown that 34% of study respondents strongly agreed that ease of navigation influenced utilization of EMRs in CCC services, 34% agreed, 4% were neutral, 14% disagreed and 14% strongly disagreed. Findings at the same time showed that 43% of the health professionals strongly agreed that efficiency influenced utilization of EMRs in CCC services, 27% agreed, 5% were neutral, 14% disagreed and 11% strongly disagreed. The outcomes with respect to personalization showed that 21% strongly agreed that personalization

influenced utilization of EMRs in CCC services, 41% agreed, 16% were neutral, 11% disagreed and 11% strongly disagreed. 39% of respondents strongly agreed that security/privacy influenced utilization of EMRs in CCC services, 36% agreed, 12% disagreed and 13% strongly disagreed. With regards to user support, 25% strongly agreed that user support influenced utilization of EMRs in CCC services, 34% agreed, 10% were neutral, 14% disagreed while 17% strongly disagreed. 69% of respondents on the other hand strongly agreed that assurance/trust influenced utilization of EMRs in CCC services while 31% agreed. Among the respondents, 34% strongly agreed that user friendly interface influenced utilization of EMRs in CCC services, 29% agreed, 11% were neutral, 11% disagreed and 15% strongly disagreed. The findings revealed that 36% of health professionals strongly agreed that reliability influenced utilization of EMRs in CCC services, 23% agreed, 18% were neutral, 10% disagreed and 13% strongly disagreed. Lastly, the study outcomes established that 32% of the participants strongly agreed that flexibility influenced utilization of EMRs in CCC services, 19% agreed, 17% disagreed and 32% strongly disagreed as in table 4.5. This implied that the utilization of EMRs in CCC services was positively influenced by a variety of EMR aspects within Nairobi County Kenya.

4.4.2 Relationship between adoption levels and health workers utilization of EMRs in CCC services

Analysis of variance (ANOVA) was conducted by the study on the relationship between adoption levels and health workers utilization of EMRs in CCC services at 95% confidence level and results presented in table 4.6.

Table 4. 6: ANOVA on Relationship between adoption levels and health workers utilization of EMRs in CCC services

		Sum of Squares	df	Mean Square	F	Sig.
Access and speed	Between Groups	19.615	2	9.808	6.779	.002
	Within Groups	140.345	97	1.447		
	Total	159.960	99			
Ease of navigation	Between Groups	61.064	2	30.532	20.720	.000
	Within Groups	142.936	97	1.474		
	Total	204.000	99			
Efficiency	Between Groups	1.124	2	.562	.277	.758
	Within Groups	196.586	97	2.027		
	Total	197.710	99			
Personalization	Between Groups	37.000	2	18.500	15.208	.000
	Within Groups	118.000	97	1.216		
	Total	155.000	99			
Security/Privacy	Between Groups	5.365	2	2.683	1.349	.264
	Within Groups	192.875	97	1.988		
	Total	198.240	99			
User support	Between Groups	90.048	2	45.024	38.651	.000
	Within Groups	112.992	97	1.165		
	Total	203.040	99			
Assurance/Trust	Between Groups	.204	2	.102	.468	.628
	Within Groups	21.186	97	.218		
	Total	21.390	99			
User friendly interface	Between Groups	43.458	2	21.729	13.077	.000
	Within Groups	161.182	97	1.662		
	Total	204.640	99			
Reliability	Between Groups	17.925	2	8.962	4.932	.009
	Within Groups	176.265	97	1.817		
	Total	194.190	99			
Flexibility	Between Groups	9.085	2	4.543	1.558	.216
	Within Groups	282.875	97	2.916		
	Total	291.960	99			

The findings in table 4.6 established that in Nairobi County, there was a statistical significant relationship between access and speed of utilization and adoption of EMRs

(x=9.888, f=6.776 and p=0.002) as the p-value is lower than p=0.000. ease of navigation also had a significant relationship with adoption of EMRs in CCC as the p-value of 0.000 was lower than p=0.005, there was no relationship between efficiency and EMR adoption as the p-value was 0.758, there was a significant relationship p=0.000 between personalization and EMR adoption by health professionals, there was no statistical relationship p=0.264 between security and EMR adoption, there was statistical significant relationship p=0.000 between user support and EMR adoption, there was no relationship p=0.628 between user support and EMR adoption, there was a statistical relationship p=0.000 between user friendly interface and EMR adoption by health workers, there was also statistical significant relationship p=0.009 between reliability and EMR adoption whereas there was no statistical relationship between flexibility and EMR adoption by health personnel in CCC of Nairobi County Kenya. These findings therefore implied that there was a relationship between perceptions of health workers and utilization/adoption of EMRs in the CCC within health care centres in Nairobi County Kenya.

4.5 Organizational Factors and EMR Adoption in CCC

The study sought to assess the influence of organizational factors on EMR adoption in CCC services in Nairobi County health care facilities and findings presented in this section in the form of frequencies, percentages and inferential statistics (ANOVA) using tables and figures.

4.5.1 Type of Health Facility

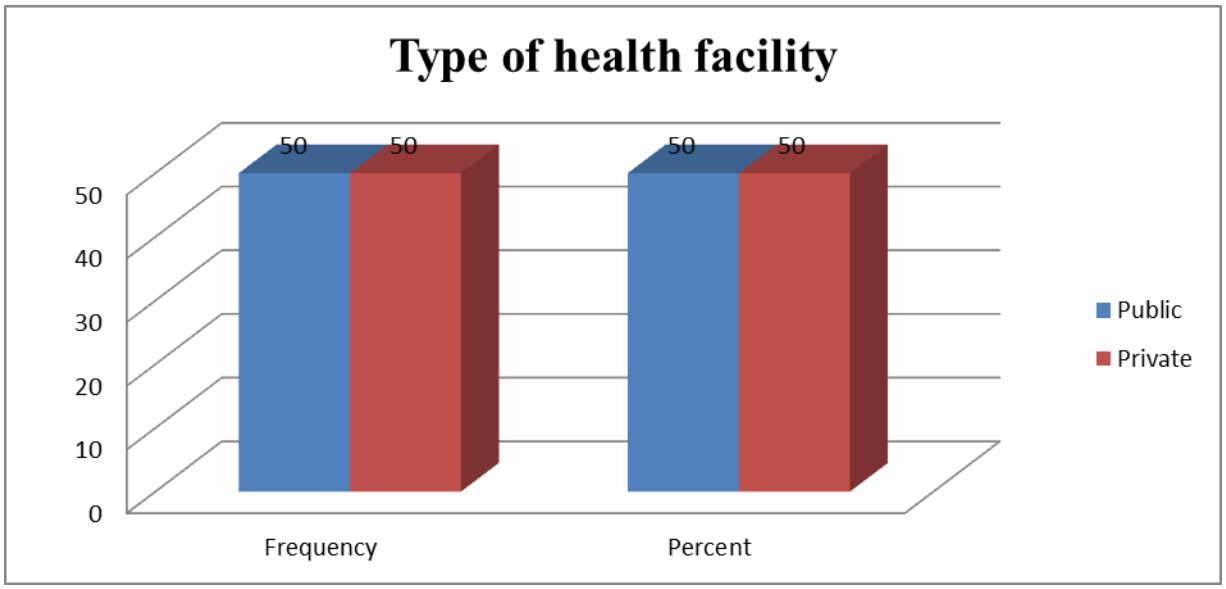

Figure 4. 1: Category of health facility

The study found that 50% of the health facilities were public while the remaining 50% were private as findings in figure 4.1 revealed. Therefore, the data presented in the study are representative of both public and private health centres in Nairobi County Kenya. The study also found that the level of health facilities influenced the decision to adopt EMR as a majority of 64% observed while 36% said otherwise. The findings therefore implied that the level of health centres in Nairobi County was a factor influencing the adoption of EMRs.

4.5.2 Facility that is likely to adopt EMR in CCC services

Table 4. 7: Facility that is likely to adopt EMR in CCC services

	Frequency	Percent
Health Center	27	27.0
Hospitals	55	55.0
Dispensary	18	18.0
Total	**100**	**100.0**

According to the study findings in table 4.7, facilities likely to adopt EMR in CCC services were as follows, 27% of health centres, 55% of hospitals and 18% of dispensaries. This implies that hospitals were more likely to adopt EMR in CCC services than health centres and dispensaries in Nairobi County.

4.5.3 Accessed EMR facility

Table 4. 8: Accessed EMR facility

	Frequency	Percent
Telephone	23	23.0
Email	48	48.0
Internet (Social Media)	29	29.0
Total	**100**	**100.0**

The findings of the study also showed that 73% of health professionals had access to EMR facilities while 27% did not. This implies that in Nairobi County, majority of the health professionals have access to EMR facilities in CCC. As in table 4.8, 23% of respondents mentioned that they accessed telephones, 48% accessed emails and 29% accessed social media. This implied that more health professionals working in CCC in Nairobi utilized their emails more than telephone and social media platforms. The study results showed that 40% of health professionals were happy with the quality of EMR systems in the health facilities they were working in while 60% were not. The study further showed that all health professionals 100% mentioned that the quality of health systems influenced their adoption of EMR.

The findings of the study also revealed that 46% of respondents observed that the rate of information intensity in their health facility was high while 54% mentioned it was

low. This implied that information intensity in CCC in Nairobi County was generally low. Further, the study established that 66% of study participants agreed that information intensity contributed to the level of EMR adoption while 34% disagreed. It is therefore clear from the result that information intensity within CCC in Nairobi County contributed to the levels of EMR adoption witnessed. Results of the study also indicated that 38% of health professionals agreed that health facilities EMR systems were adequately specialized and or aligned to current services while a majority of 62% disagreed. This suggests that EMR systems in health facilities in Nairobi County were not aligned to current services.

The study also established that 82% of health professionals agreed that management of health institutions were supportive of innovation while 18% disagreed. This indicated that in Nairobi County, CCC institutions management were supportive of innovations. A majority of 68% of health professionals agreed that management support affected their willingness to adopt EMR while 32% said that this support did not affect their willingness to adopt EMR. This implied that health professionals' decision to adopt EMR in the CCC was largely dependent in management support.

The results of the study also showed that all health professionals 100% in Nairobi County used EMR facilities voluntarily indicating an overwhelming acceptability of EMR by health professionals. The findings of the study further showed that 24% of health professionals felt that voluntary use of EMR facilities contributed to their adoptions whereas 76% felt that this had nothing to do with EMR adoption in their respective CCC.

4.5.4 EMR specialization/alignment has contributed to EMR adoption

Table 4. 9: EMR specialization/alignment has contributed to EMR adoption

	Frequency	Percent
Strongly disagree	15	15.0
Disagree	13	13.0
Agree	33	33.0
Strongly Agree	39	39.0
Total	**100**	**100.0**

The study results presented in table 4.9 strongly disagreed that EMR alignment had contributed to EMR adoption, 13% disagreed with the statement, 33% agreed that EMR alignment had contributed to EMR adoption while 39% strongly agreed with the statement. This implied that in Nairobi County, EMR alignment generally contributed to their adoption in CCC.

4.5.5 Level at which information intensity contributes to EMR adoption

Table 4. 10: Level at which information intensity contributes to EMR adoption

	Frequency	Percent
Very little	14	14.0
Little	8	8.0
Moderate	8	8.0
Much	31	31.0
Very much	39	39.0
Total	**100**	**100.0**

On the level at which information intensity contributed to EMR adoption, results in table 4.10 revealed that 14% of health professionals said to a very little level, 8% said to a little level, 8% mentioned to a moderate level, 31% said to a much while 39% mentioned information intensity contributed to EMR adoption very much. From the

findings, it was clear that information intensity contributed to EMR adoption very much within CCC in Nairobi County Kenya.

4.5.6 Level at which use of EMR in the facility is voluntary

Table 4. 11: Level at which use of EMR in the facility is voluntary

	Frequency	Percent
Strongly agree	44	44.0
Agree	35	35.0
Disagree	8	8.0
Strongly disagree	13	13.0
Total	**100**	**100.0**

With respect to levels at which use of EMR was voluntary in health facilities, results in table 4.11 showed that 44% of respondents strongly agreed, 35% agreed, 8% disagreed while 13% strongly disagreed. This implied that utilization of EMR was majorly voluntary within health facilities in Nairobi County Kenya.

4.5.7 Level of satisfaction with the quality of EMR systems

Table 4. 12: Level of satisfaction with the quality of EMR systems

	Frequency	Percent
Very Unsatisfactory	20	20.0
Unsatisfactory	12	12.0
Neutral	14	14.0
Satisfactory	26	26.0
Very satisfactory	28	28.0
Total	**100**	**100.0**

Results in table 4.12 revealed that on level of satisfaction with the quality of EMR systems, 20% of health professionals felt that they were very unsatisfied, 12% found

them unsatisfied, 14% were neutral, 26 were satisfied while 28% mentioned that they were very satisfied with the quality of EMR systems. This implied that health professionals working in Nairobi County were overally satisfied with the quality of EMR systems in their health facilities. The study findings also showed that 23% of study participants agreed that adequate resources facilitated EMR adoption while 77% strongly agreed. This therefore implied that availability of resources was a key factor in the adoption of EMR by CCC in Nairobi County.

4.5.8 Health professionals' ratings of adequacy of the following resources in the health facilities

Table 4. 13: Health professional's ratings of adequacy of the following resources in the health facilities

	Yes		**No**	
	F	**%**	**F**	**%**
Financial resources	41	41.0	59	59.0
Technological resources	51	51.0	49	49.0

Results of the study as presented in table 4.13 showed that 41% of the health professionals felt that financial resources were adequate for adoption of new EMRs while 59% felt they were inadequate. A slight majority of 51% mentioned that technological resources needed for new technologies were adequate while 59% felt that they were not. This implied that while financial resources for new EMR adoption were inadequate in health centres in Nairobi County, the technological resources on the other hand were adequate.

4.5.9 Relationship between Organizational Factors and EMR Adoption in CCC

The study utilized ANOVA in order to test the relationship between organizational factors and EMR adoption in CCC in Nairobi County Kenya and results presented in table 4.14.

Table 4. 14: ANOVA Relationship between Organizational Factors and EMR Adoption in CCC

		Sum of Squares	df	Mean Square	F	Sig.
Information intensity	Between Groups	2.686	2	1.343	6.595	.002
	Within Groups	19.754	97	.204		
	Total	22.440	99			
Alignment of EMR systems to current services offered	Between Groups	2.624	2	1.312	6.080	.003
	Within Groups	20.936	97	.216		
	Total	23.560	99			
Management support of innovations	Between Groups	3.924	2	1.962	17.562	.000
	Within Groups	10.836	97	.112		
	Total	14.760	99			
Adequate resources	Between Groups	4.899	2	2.450	18.549	.000
	Within Groups	12.811	97	.132		
	Total	17.710	99			

Analysis of variance results in table 4.14 revealed that there was a statistical significant relationship between information security and EMR adoption in CCC in Nairobi County as the p-value of p=0.002 was lower than p=0.002, there was a statistical significant relationship between alignment of EMR to current services offered by health organization and EMR adoptions as the p-value of p=0.003 was lower that p=0.05, there was further a statistical significant relationship between managements support of innovation and EMR adoption as the p-value was p=0.000

which was also lower than p=0.05, lastly, the study established that there was a statistical significant relationship between adequacy of financial and technological resources and EMR adoption by CCC in Nairobi County as the p-value of p=0.000 was lower than p=0.005. Therefore the study rejects the null hypothesis of the study that organizational factors that influence EMR utilization are not significantly associated with EMR utilization levels in services offered by HIV and AIDS CCC in Nairobi County.

4.6 Technological Factors and EMR adoption in CCC

The study also assessed the influence of technological factors on EMR adoption in CCC in Nairobi County Kenya and findings are presented in frequencies, percentages and inferential statistics using tables.

With respect to technological factors, the study established that all health professionals 100% were of the view that health facilities that adopt EMR would have relative advantage over others. Similarly, all respondents (100%) agreed that relative advantage of health facilities influenced the facilities decision to adopt EMR in Nairobi County.

4.6.1 Potential benefits of adoption of ICCT by CCC

Table 4. 15: Potential benefits of adoption of ICCT by CCC

	Frequency	Percent
Improved services e.g. ART, Services	16	16.0
Improved patient Satisfaction	23	23.0
Improved information Storage and retrieval	6	6.0
Improved service efficiency	22	22.0
Improvement in communication	15	15.0
Improvement of drugs and other supplies availability	18	18.0
Total	**100**	**100.0**

Study outcomes on potential benefits of EMR adoption by CCC as presented in table 4.15 revealed that 16% of the study participants were of the view that the adoptions improved services such as ART, 23% mentioned it improved patient satisfaction, 6% stated that it improved information storage and retrieval, 22% stated that it improved service efficiency, 15% mentioned that it improved communication while 18% mentioned that the adoption of EMR improved availability of drugs and other supplies. The results implied that EMR adoption by health care sector had numerous advantages and or benefits to CCC in Nairobi County Kenya.

4.6.2 Health professionals ranking of the extent to which certain factors enhance the adoption of EMR in health facilities

Table 4. 16: Health professionals ranking of the extent to which certain factors enhance the adoption of EMR in health facilities

	Very weak		**Weak**		**Neutral**		**Strong**		**Very strong**	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
Complexity of facilities	13	13.0	12	12.0	9	9.0	26	26.0	40	40.0
Lack of compatibility of EMR facilities	35	35.0	26	26.0	6	6.0	22	22.0	11	11.0
Affordability of EMR	0	0.0	9	9.0	0	0.0	27	27.0	64	64.0
Information Security	0	0.0	8	8.0	0	0.0	17	17.0	75	75.0
Lack of improvement in the image of the facility	49	49.0	25	25.0	0	0.0	15	15.0	11	11.0

Findings of the study as presented in table 4.16 revealed that health professionals ranked the extent to which complexities of facilities enhanced the adoption of EMR facilities as very strong, 35% ranked the extent to which to which lack of compatibility of EMR facilities enhanced the adoption of EMR facilities as very weak, 64% ranked the extent to which to which affordability of EMR facilities enhanced the adoption of EMR facilities as very strong, 75% ranked the extent to which to which information security enhanced the adoption of EMR facilities as very strong while 49% ranked the extent to which to which lack of improvement in the image of the facility enhanced the adoption of EMR facilities as very weak. These findings implied that generally the studied factors positively enhanced the adoption of EMR facilities by health facilities in Nairobi County Kenya.

4.6.3 Relationship between Technological Factors and EMR adoption in CCC

ANOVA was further used to test the relationship between technological factors and EMR adoption by CCC in Nairobi County Kenya and results presented in table 4.17.

Table 4. 17: ANOVA Relationship between Technological Factors and EMR adoption in CCC

		Sum of Squares	df	Mean Square	F	Sig.
Complexity of facilities	Between Groups	109.715	2	54.857	56.581	.000
	Within Groups	94.045	97	.970		
	Total	203.760	99			
Lack of compatibility	Between Groups	16.968	2	8.484	4.377	.015
	Within Groups	187.992	97	1.938		
	Total	204.960	99			
Affordability of EMR	Between Groups	23.995	2	11.998	21.219	.000
	Within Groups	54.845	97	.565		
	Total	78.840	99			
Information Security	Between Groups	9.429	2	4.714	7.286	.001
	Within Groups	62.761	97	.647		
	Total	72.190	99			
Lack of improvement in the image of the facility	Between Groups	21.381	2	10.690	5.616	.005
	Within Groups	184.659	97	1.904		
	Total	206.040	99			

Inferential statistics on table 4.17 showed that in Nairobi County health facilities, there was a statistical significant relationship p=0.000 between complexity of facilities and EMR adoption by CCC, significant relationship p=0.015 between lack of compatibility and EMR adoption by CCC, a statistical significant relationship p=0.000 between affordability of EMR and EMR adoption by CCC, statistical significant relationship p=0.001 between information security and EMR adoption by CCC and lastly a significant relationship p=0.005 between lack of improvement of the image of health facilities and EMR adoption by CCC. Therefore, the study reveals

that there was a relationship between the dependent and independent variables leading to the rejection of the null hypothesis which stated that technological factors that influence EMR utilization are not significantly associated with EMR utilization levels in services offered by HIV and AIDS CCC in Nairobi County.

4.7 External Environment and EMR Adoption by CCC

In this sub-section, results on the influence of external environment on EMR adoption by CCC in Nairobi County Kenya are presented in frequencies, percentages and inferential statistics using tables.

4.7.1 Health Professionals Ranking of the competition strengths of the facility you work in

Table 4. 18: Ranking of the competition strengths of the facility you work in

	Frequency	Percent
Very Weak	11	11.0
Weak	5	5.0
Neutral	24	24.0
Strong	22	22.0
Very strong	38	38.0
Total	**100**	**100.0**

As presented in table 4.18, 11% of health professionals ranked competition strength of health facility they worked in as very weak, 5% ranked it as weak, 24% said it was neutral, 22% ranked it as strong and 38% ranked competition strength of their health facility as very strong. The findings therefore implied that in Nairobi County, competition strength of most health facilities were very strong.

All health professionals (100%) agreed that EMR adoption could enable health facilities deal with competitive pressure implying that all health facilities in Nairobi

County need to adopt EMR facilities in order to stay above their competitors are at least at par with them. The study also established that 59% of respondents mentioned that EMR adoption by other health centres influenced their own health organizations adoption of EMR facilities whereas 41% denied this. Therefore, in Nairobi County, adoption of EMR facilities by one health facility influenced its adoption by its competitors.

4.7.2 How health facilities compare with others in terms of EMR adoption

Table 4. 19: How health facilities compare with others in terms of EMR adoption

	Frequency	Percent
Lagging behind	45	45.0
At par with others	35	35.0
Far much ahead of others	20	20.0
Total	**100**	**100.0**

In table 4.19, results show that 45% of health facilities in Nairobi County were lagging behind their competitors in terms of EMR adoption, 35% were at par with their competitors while 20% were way above their competitors in EMR adoption. This implied that a substantial number of health facilities did not have adequate and or relevant EMRs implemented making them lag behind others.

The study also established that all the health professionals (100%) agreed that the Kenyan government had enacted laws and policies to influence ICD adoption by CCC in Nairobi County. The study further established that government policies had not affected EMR adoption in specific CCC to a great extent as a majority of 70% of respondents mentioned while 30% mentioned that it affected to a great extent. The study also revealed that 59% of the respondents were of the view that the government had not developed adequate national EMR infrastructure while 41% said that it had

developed enough infrastructure. The findings also showed that 32% of the health professional mentioned that the EMR infrastructure by the government was enough to support the adoption of EMRs by CCC while a majority of 68% disagreed. This implied that, EMR infrastructure developed by the national government was to not adequate to positively influence its adoption by health facilities.

The findings of the study further showed that all health professionals (100%) agreed that there was shared national values concerning EMR in Kenya. A majority of these participants (75%) also stated that the shared national values concerning EMR contributed to their adoption by CCC in Kenya whereas 25% disagreed. Therefore, the shared values greatly influenced EMR adoption by most CCC in Nairobi County.

4.7.3 The rate at which the national culture affects EMR adoption

Table 4. 20: The rate at which the national culture affects EMR adoption

	Frequency	**Percent**
Very little	14	14.0
Little	8	8.0
Moderate	20	20.0
Big	30	30.0
Very big	28	28.0
Total	**100**	**100.0**

On the rate at which the shared national values influenced and or affected EMR adoption by health centres, 14% of participants said it was to a very little rate, 8% mentioned to a little rate, 20% were neutral, 30% mentioned it affected much while 28% mentioned that it affected very much as findings in table 4.20 showed. This implied that in Nairobi County, shared national values on EMR influenced its adoption generally to a high extent by CCC. Other findings of the study showed that

all participants (100%) were in agreement that their health centres were under a lot of pressure from patients requiring their services. Similarly, all the respondents (100%) were in agreement that pressure from patients generally influenced EMR adoption by CCC in Nairobi County.

4.7.4 Relationship between External Environment and EMR adoption in CCC

In table 4.21, the study presents the ANOVA results on the relationship between external environment and EMR adoption in CCC in Nairobi County which was tested at 95% confidence level.

Table 4. 21: ANOVA Relationship between External Environment and EMR adoption in CCC

		Sum of Squares	df	Mean Square	F	Sig.
Competition strengths	Between Groups	23.283	2	11.642	7.563	.001
	Within Groups	149.307	97	1.539		
	Total	172.590	99			
Government policies	Between Groups	3.735	2	1.867	10.492	.000
	Within Groups	17.265	97	.178		
	Total	21.000	99			
Government EMR infrastructure provisions	Between Groups	4.370	2	2.185	12.187	.000
	Within Groups	17.390	97	.179		
	Total	21.760	99			
Shared national values concerning EMR	Between Groups	4.610	2	2.305	15.812	.000
	Within Groups	14.140	97	.146		
	Total	18.750	99			

On the relationship between external environment and EMR adoption, the findings of the study as presented in table 4.21 showed that there was a statistical significant relationship p=0.001 between competition strength and EMR adoptions in CCC, there was a statistical significant relationship p=0.000 between government policies and

EMR adoptions in CCC, a statistical significant relationship p=0.000 between government EMR infrastructure provisions and EMR adoptions in CCC and lastly, that there existed a statistical significant relationship p=0.001 between shared national values concerning EMR and EMR adoptions in CCC in health care centres in Nairobi County. Therefore, there was a statistical significant relationship between EMR adoption by CCC and the external environment of health facilities in Nairobi County Kenya.

4.8 Barriers/Challenges Faced in EMR Implementation

The study lastly gathered data on barriers facing implementation of EMRs by CCC in health facilities of Nairobi County and results presented in frequencies, percentages and inferential statistics in tables and figure as follows.

4.8.1 Health Personnel's Area of Management

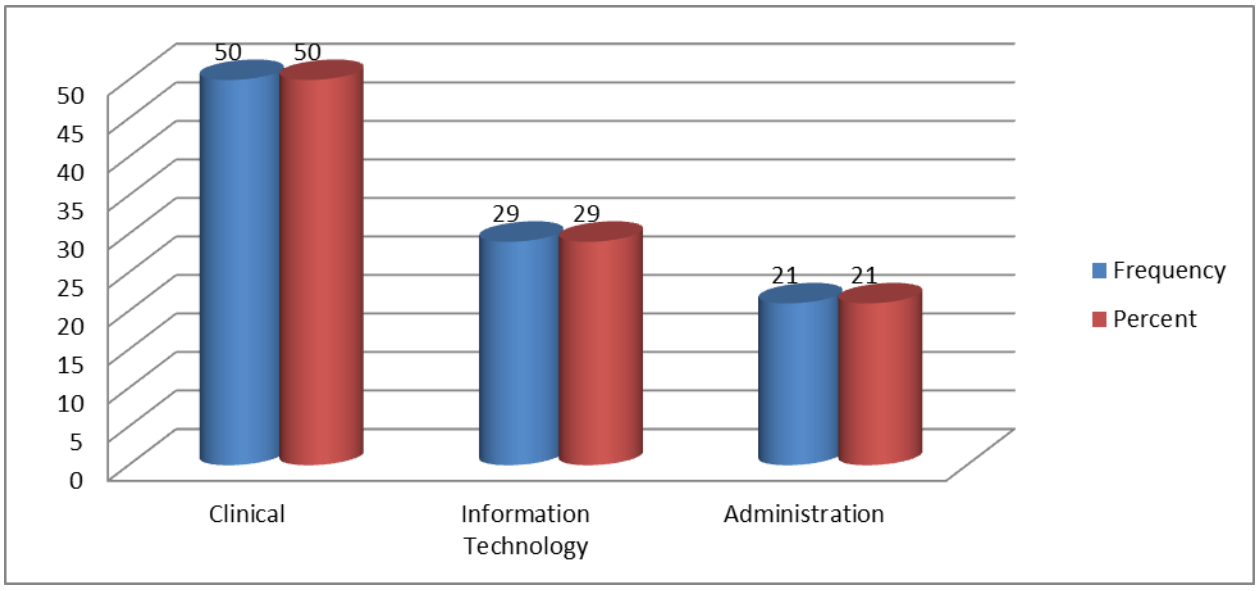

Figure 4. 2: Health Personnel's Area of Management

The study sought to assess areas of management of health professionals who took part in this study and the findings in figure 4.2 showed that 50% were clinical managers, 29% were information technology managers while 21% were administrations managers within their respective health facilities in Nairobi County Kenya. The study

further revealed that all health professionals in Nairobi County (100%) encountered challenges with respect to the implementation of EMRs in CCC.

4.8.2 Planning Area deserving of more Attention

Table 4. 22: Planning Area Deserving of more Attention

	Frequency	Percent
Selection of EMR system	15	15.0
Phase out process of paper –based system to EMR system	28	28.0
Training and sensitization of staff on EMR	37	37.0
Integration of EMR with any systems in place or with existing paper based system in larger hospital	20	20.0
Total	**100**	**100.0**

The study established that 15% health professionals were of the view that selection of EMR systems was the planning area needing more attention, 28% mentioned phase out process of paper based system to EMR system, 37% mentioned training and sensitization of staffs on EMR while 20% mentioned integration of EMR with any systems in place or with existing paper based system in larger hospitals as findings in table 4.22 indicate. This suggest that training and sensitization of staffs on EMR was the key planning area that health facilities in Nairobi County needed to pay more attention to.

4.8.3 Technical component that contributed to challenges in the implementation process

Table 4. 23: Technical component that contributed to challenges in the implementation process

	In the technical component whether the following contributed to challenges in the implementation process	
	Yes	**No**
Internet connectivity	63(63.0)	37(37.0)
Numerous electrical supply shortages	29(29.0)	71(71.0)
Difficulties in networking	12(12.0)	88(88.0)
Poor flexibility and adaptability of EMR to clinic flow	79(79.0)	21(21.0)

The findings presented in Table 4.23 highlight various technical components contributing to challenges in the implementation of Electronic Medical Records (EMRs). Specifically, 63% of health professionals identified internet connectivity as a significant factor in these challenges. In contrast, 71% disagreed that numerous electrical supply shortages were a contributing factor, and 88% disagreed that networking difficulties posed a challenge. However, 79% agreed that poor flexibility and adaptability of EMRs to clinic workflows were notable contributors to the difficulties faced in the implementation process. These results indicate that certain factors do indeed contribute to the challenges experienced by health centers in Nairobi County regarding EMR implementation.

4.8.4 Relationship between barriers/challenges faced in EMR implementation in CCC

The study tested for relationship between barriers faced in EMR implementation in CCC in Nairobi County at 95% confidence level and findings presented in table 4.24.

Table 4. 24: ANOVA Relationship between barriers/challenges faced in EMR implementation in CCC

		Sum of Squares	df	Mean Square	F	Sig.
Internet connectivity	Between Groups	2.124	2	1.062	4.863	.010
	Within Groups	21.186	97	.218		
	Total	23.310	99			
Numerous electrical supply shortages	Between Groups	5.586	2	2.793	18.058	.000
	Within Groups	15.004	97	.155		
	Total	20.590	99			
Difficulties in networking	Between Groups	1.833	2	.916	10.185	.000
	Within Groups	8.727	97	.090		
	Total	10.560	99			
Poor flexibility and adaptability of EMR to clinic flow	Between Groups	4.985	2	2.492	20.833	.000
	Within Groups	11.605	97	.120		
	Total	16.590	99			

The results presented in Table 4.24 reveal several significant relationships between challenges and the adoption of Electronic Medical Records (EMR) in Comprehensive Care Centres (CCC) in Nairobi County. Specifically, there was a statistically significant relationship between internet connectivity issues (p=0.010) and EMR adoption, numerous electrical power shortages were found to have a statistically significant relationship (p=0.000) with EMR adoption. Difficulties in networking also showed a statistically significant relationship (p=0.000) with EMR adoption. Poor

flexibility and adaptability of EMR to clinic workflows had a statistically significant relationship (p=0.000) with EMR adoption. These findings indicate that barriers and challenges significantly impact EMR adoption in CCCs within Nairobi County, Kenya.

CHAPTER FIVE: DISCUSSIONS

5.1 Health workers EMR adoption

The study discovered that all Comprehensive Care Centers (CCCs) in Nairobi County had fully installed Electronic Medical Records (EMRs), making them readily accessible and utilized by health workers on a regular basis. The adoption of EMRs in these healthcare facilities significantly enhanced operational efficiency, enabling them to streamline services and collect and analyze quality data efficiently. EMR adoption also facilitated easy access to patient records at any time, thereby improving overall clinic efficiency.

Despite the benefits, the study identified several disadvantages associated with EMRs in the context of Nairobi's health centers. Challenges included difficulties accessing records during power outages or poor internet connectivity, limited computer literacy among staff, complex systems requiring advanced computer skills, and potential job losses in certain departments due to EMR implementation. Furthermore, the study highlighted potential challenges in the EMR implementation process, such as health professionals' unfamiliarity with computer usage, potential delays in patient management, and obstacles in accessing patient records following EMR adoption by CCCs in Nairobi County.

These findings resonate with previous research by Williams and Boren (2008), who outlined the various benefits of EMR implementation, including improved healthcare quality, service delivery, and decision-making processes. Similarly, the results align with Sumbi's (2016) findings, emphasizing how EMRs facilitate collaboration among healthcare personnel like doctors and nurses to enhance overall healthcare service delivery. Additionally, the study is in line with Waithera et al.'s (2017) findings, which illustrated the significant positive impacts of EMR implementation within

healthcare facilities, fostering collaboration and increasing productivity both internally and externally.

5.2 Health Workers Perceptions on Utilization of EMRs in CCC Services

The study found that the perception of doctors and clinical officers significantly influenced the utilization of Electronic Medical Records (EMRs) in Nairobi County. Factors such as access and speed, ease of navigation, efficiency, personalization, security/privacy, user support, assurance/trust, user-friendly interface, reliability, and flexibility were identified as key determinants affecting EMR utilization in Comprehensive Care Centers (CCCs).

The study revealed several significant relationships between these factors and EMR adoption by health professionals. For instance, there was a statistically significant relationship between access and speed of utilization and EMR adoption ($x=9.888$, $f=6.776$, $p=0.002$), while ease of navigation also showed a significant relationship with EMR adoption ($p=0.000$). Personalization, user support, and user-friendly interface were also found to have significant relationships with EMR adoption. Conversely, factors such as efficiency, security, and flexibility did not show significant relationships with EMR adoption.

These findings suggest a link between health workers' perceptions and the adoption of EMRs in CCCs within health care centers in Nairobi County, Kenya. The results align with previous research by Ludwick et al. (2009), which highlighted negative perceptions towards EMRs among doctors due to unfriendly user interfaces. The study also supports the technology acceptance model proposed by Silva (2015), indicating that perceived usefulness and ease of use are crucial factors influencing the adoption and use of technology among targeted users.

5.3 Organizational Factors and EMR Adoption in CCC

Regarding the influence of organizational factors on EMR adoption in Comprehensive Care Centres (CCC) in Nairobi County, the study found that the type of health facility primarily affected the decision to adopt EMR, with hospitals being the most likely to implement it. It was also found that 73% of health professionals had access to EMR facilities; however, the level of information intensity in these facilities was generally low. This low information intensity was identified as a factor contributing to the extent of EMR adoption. The results indicate that the level of information intensity within CCCs in Nairobi County significantly impacted EMR adoption. Despite EMR systems being adopted by 62% of health facilities, many of these systems were not adequately specialized or aligned with current services.

Additionally, in 82% of health centres in Nairobi County, management support for innovation was found to significantly influence health professionals' willingness to adopt EMR. These findings align with Sumbi (2016), who noted that while many benefits have been realized by hospitals that implemented EMR systems in Kenya, challenges such as financial and technical constraints have hindered the full implementation and utilization of this technology.

ANOVA results demonstrated a statistically significant relationship between information security and EMR adoption in CCCs in Nairobi County, with a p-value of 0.002, which is lower than the threshold of 0.05. A significant relationship was also observed between the alignment of EMR systems with current services offered by health organizations and EMR adoption, with a p-value of 0.003. Furthermore, management support for innovation showed a significant relationship with EMR adoption, with a p-value of 0.000. Lastly, the study found a significant relationship

between the adequacy of financial and technological resources and EMR adoption, with a p-value of 0.000. Therefore, the study rejects the null hypothesis that organizational factors influencing EMR utilization are not significantly associated with EMR adoption levels in HIV and AIDS CCCs in Nairobi County.

5.4 Technological Factors and EMR Adoption in CCC

In relation to the impact of technological factors on EMR adoption in Comprehensive Care Centres (CCC) in Nairobi County, Kenya, it was determined that all healthcare professionals (100%) believed that facilities adopting EMR would gain a relative advantage over others. This perceived advantage influenced their decision to adopt EMR in Nairobi County. The benefits of EMR adoption by CCCs included enhanced services such as ART, improved patient satisfaction, better information storage and retrieval, increased service efficiency, improved communication, and enhanced availability of drugs and supplies.

Inferential statistics revealed significant relationships in Nairobi County health facilities: a statistical significance of p=0.000 was observed between facility complexity and EMR adoption by CCCs, p=0.015 between compatibility issues and EMR adoption, p=0.000 concerning the affordability of EMR, p=0.001 regarding information security, and p=0.005 concerning the enhancement of the facility's image. Therefore, the study confirms a relationship between the dependent and independent variables, leading to the rejection of the null hypothesis, which posited that technological factors influencing EMR utilization are not significantly associated with service levels in HIV and AIDS CCCs in Nairobi County.

5.5 External Environment and EMR Adoption by CCC

The study revealed that the competition strength of health facility personnel was generally very strong and that Electronic Medical Records (EMR) adoption could help health facilities cope with competitive pressure. It was found that 45% of health facilities in Nairobi County were lagging behind their competitors in terms of EMR adoption, despite government laws and policies aimed at promoting EMR adoption. The study also indicated that government policies had a limited impact on EMR adoption within specific health facilities and that the national EMR infrastructure provided by the government was insufficient to support EMR adoption by health facilities in the County. Additionally, health centers were facing significant pressure from patients in need of their services.

Regarding the relationship between the external environment and EMR adoption, the study's findings presented in table 4.21 demonstrated a statistically significant relationship ($p=0.001$) between competition strength and EMR adoption in health facilities. There were also statistically significant relationships ($p=0.000$) between government policies, government-provided EMR infrastructure, shared national values related to EMR, and EMR adoption by health facilities. Consequently, there was a statistically significant relationship between EMR adoption by health facilities and the external environment in Nairobi County, Kenya.

5.6 Barriers/Challenges Faced in EMR Implementation

The findings revealed that all health professionals in Nairobi County (100%) encountered challenges during the implementation of Electronic Medical Records (EMRs) in Comprehensive Care Centres (CCCs). Key planning areas identified for further attention included the selection of EMR systems, transitioning from paper-

based to EMR systems, staff training and awareness, and integrating EMRs with existing systems or paper-based records in larger hospitals. Technical aspects contributing to these implementation challenges included issues such as internet connectivity, frequent power shortages, networking difficulties, and the limited adaptability of EMRs to clinic workflows.

An analysis of the barriers to EMR implementation in CCCs within Nairobi County, conducted at a 95% confidence level, identified significant associations. Notably, there was a significant relationship between internet connectivity challenges ($p=0.010$) and EMR adoption. Additionally, substantial linkages were observed between power shortages ($p=0.000$), networking difficulties ($p=0.000$), and the lack of flexibility in adapting EMRs to clinic workflows ($p=0.000$) with EMR adoption rates in CCCs across Nairobi County. This indicates a statistical correlation between these barriers and the adoption of EMRs in healthcare facilities.

These findings are consistent with previous studies by Pare et al. (2014), Khalifa (2013), and Sumbi (2016), which identified financial and technical obstacles as primary challenges in the deployment of EMRs in hospital settings. For instance, Pare et al. (2014) highlighted the impact of technical issues on EMR adoption, while Khalifa (2013) emphasized the role of infrastructure in successful implementation. Sumbi (2016) similarly noted that network and power-related problems significantly affect the effectiveness of EMR systems.

CHAPTER SIX: SUMMARY, CONCLUSSION AND RECOMMENDATIONS

6.1 Introduction

In this section a summary based on study results in presented, using the findings of the study, conclusions are drawn while recommendations of the study and areas for further studies are further guided by the documented study outcomes.

6.2 Summary of the Main Findings

6.2.1 Health workers EMR adoption

On EMR adoption by health workers, it was found that all CCC 100% had installed EMRs hence EMR were accessible by health workers and utilized by health personnel on a daily basis. Adopted electronic medical records helped clinics to improve efficiency in service within the CCC of Nairobi County, adoption of EMRs aided health centres to collect and review quality data, provide access to patients' records any time and create efficiency in the clinic. The study also found that the disadvantages of electronic medical records in Nairobi health centres CCC included inability to access records during power blackout, inability to access patients records when internet connectivity is poor, low level of computer literacy in staffs, complicated systems requiring high level skills in computer usage and loss of jobs in some department were the disadvantages of EMR adoption. However, potential challenges in EMR implementation process were found to be that health professionals were not very conversant with using computers, patient management would take longer due to the use of the EMRs and that there would be difficulties in accessing patients record due to the implementations of EMRs by the CCC in Nairobi County.

6.2.2 Health Workers Perceptions on Utilization of EMRs in CCC Services

The study explored how the perceptions of doctors and clinical officers influenced the utilization of Electronic Medical Records (EMRs) in Nairobi County. It found that several factors, including access and speed, ease of navigation, efficiency, personalization, security/privacy, user support, assurance/trust, a user-friendly interface, reliability, and flexibility, affected the use of EMRs in Comprehensive Care Centres (CCCs).

The study revealed that access and speed significantly influenced both the utilization and adoption of EMRs. Ease of navigation also played a significant role in EMR adoption. On the other hand, efficiency did not show a significant relationship with EMR adoption. Personalization and user support were important factors, with significant impacts on the adoption of EMRs. However, security and flexibility did not significantly affect EMR adoption. The user-friendly interface and reliability were found to be important factors in the adoption of EMRs as well. These findings suggest that the perceptions of healthcare workers are closely linked to the utilization and adoption of EMRs in CCCs within Nairobi County.

6.2.3 Organizational Factors and EMR Adoption in CCC

The study found that the type of health facility, with hospitals being more likely to adopt EMRs, significantly influenced adoption decisions. Additionally, the level of support from management for innovation was a crucial factor, affecting health professionals' willingness to use EMRs. Information intensity within health facilities was also found to contribute to EMR adoption levels. Despite these positive aspects, challenges such as inadequate specialization of EMR systems and alignment with current services were noted. These findings suggest that organizational support and

facility type are significant determinants of EMR adoption, while issues with system specialization and alignment need addressing.

6.2.4 Technological Factors and EMR Adoption in CCC

The study identified several technological factors that significantly influence the utilization of Electronic Medical Records (EMRs) in Comprehensive Care Centres (CCCs). Key factors include access and speed, ease of navigation, personalization, security/privacy, user support, a user-friendly interface, reliability, and flexibility. Access and speed, as well as ease of navigation, were found to have a strong positive impact on EMR adoption, with significant p-values indicating their importance. Personalization and user support also significantly affected EMR utilization, enhancing its adoption among healthcare workers. However, the study revealed no significant relationship between efficiency, security, or flexibility and EMR adoption. These results highlight that while some technological attributes are crucial for the effective use of EMRs, others may have less impact.

6.2.5 External Environment and EMR Adoption by CCC

The study found that perceptions of doctors and clinical officers regarding EMRs, including access speed, ease of navigation, personalization, and user support, significantly influenced their utilization of EMRs. While some factors like efficiency and security did not show a significant impact, others such as personalization and a user-friendly interface were critical. The findings indicate that the adoption of EMRs is not solely dependent on technological or organizational factors but also on the individual perceptions and experiences of healthcare professionals. These insights underline the importance of addressing both technological and personal factors to enhance EMR utilization.

6.2.6 Barriers/Challenges Faced in EMR Implementation

The results indicated that all health professionals in Nairobi County faced challenges with the implementation of Electronic Medical Records (EMRs) in Comprehensive Care Centres (CCCs). Key areas that required more attention included the selection of EMR systems, the transition from paper-based systems to EMRs, staff training and sensitization, and the integration of EMR systems with existing systems or paper-based processes in larger hospitals.

Technical challenges affecting the implementation process were identified as issues with internet connectivity, frequent electrical supply shortages, difficulties in networking, and the poor flexibility and adaptability of EMRs to clinical workflows. When examining the relationship between these barriers and EMR adoption in CCCs, it was found that internet connectivity, electrical power shortages, networking difficulties, and the lack of flexibility in EMRs all had significant relationships with EMR adoption. These findings suggest that existing barriers and challenges are statistically significant factors influencing EMR adoption in health facilities in Nairobi County.

6.3 Conclusions

The study concludes that high level EMR adoption by health workers and all CCC in Nairobi had installed EMRs enabling the health personnel to utilize these facilities on a daily basis. Adoption of electronic medical records resulted in improved efficiency in service within the CCC of Nairobi County. The study also concluded that EMR adoption by health centres had disadvantages including difficulties in accessing records during power blackout. On influence of health workers perceptions on utilization of EMRs in CCC services, the study concluded that access and speed, ease

of navigation, efficiency among other variables influenced utilization of EMRs in CCC services. The study at the same time concluded that organizational factors affected EMR adoption in CCC of Nairobi County as the findings showed that management support of innovation greatly affected health professionals' willingness to adopt EMR. It was the conclusion of this study that technical factors affected EMRs adoption in CCC of Nairobi County as the results indicated that health facilities that adopt EMR would have relative advantage over others and this advantage influenced the facilities decision to adopt EMR. Another conclusion of this study was that external environment influenced EMR adoption by CCC as the outcomes revealed that EMR adoption could enable health facilities deal with competitive pressure. Lastly, the study concluded that there were challenges to the implementation of EMRs in CCC as among others selection of EMR systems and phasing out process of paper based system to EMR system were the planning areas needing more attention.

6.4 Recommendations

The study recommends that;

- Health centres should adopt modern Electronic Medical Records (EMRs) to meet current service delivery demands and avoid the issues associated with outdated systems that could hinder service effectiveness.
- The Government of Kenya and other health and EMR stakeholders need to enhance efforts to ensure that the EMR infrastructure provided supports effective adoption of EMRs in Comprehensive Care Centres (CCCs).
- Health centres must address all technical factors that influence the adoption of EMRs to facilitate a smooth transition and utilization of these systems in CCCs.

- Additionally, it is crucial for the government and hospital management to address all identified barriers to EMR adoption in order to improve both the adoption and utilization of EMRs in health facilities.

6.5 Further Research

The study recommends further investigation in the following areas:

- Conduct a study to evaluate the relevance of adopted EMRs to the current needs of Comprehensive Care Centres (CCCs) and hospitals in Nairobi County.
- Assess health personnel-related factors affecting EMR usage in CCC services within hospitals in Nairobi County.
- Undertake a separate study to examine the impact of EMR infrastructure policies on the adoption of EMRs in CCC services within hospitals in Nairobi County.

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APPENDICES

Appendix I: Consent Form

The utilization of the electronic medical records as a continuous quality tool at Kenyatta National Hospital's Comprehensive Care Centre

This Informed Consent Form has two parts:

• Information Sheet (to share information about the study with you)

• Certificate of Consent (for signatures if you choose to participate)

You will be given a copy of the full Informed Consent Form.

Part 1: Information Sheet

Purpose of the study

The study primarily aims to assess the utilization of the EMR implemented at KNHCCC and evaluate user acceptability and barriers of EMR implementation. This study is doing a survey on acceptability of EMR and associated barriers by users in KNHCCC. This will provide important information implementers of similar system in the KNH hospital as well as other facilities that will enable a smoother transition from paper based system to use of electronic medical records system.

Type of Research Intervention

This research will involve your participation in an interviewer administered questionnaire.

Participation Selection

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. You are free to decline participation of this study at any time.

Risks

There are no identified risks.

Benefits

There will be a direct benefit to you with regards to finding out how well the implemented EMR is improving quality of patient management.

Confidentiality

We will not be sharing information about you to anyone outside of the research team. The information that we collect from this research project will be kept private. Any information about you will have a number on it instead of your name.

Part II: Certificate of consent.

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study

Participant number _____

Signature of participant _____

Date_____

Appendix II: **Questionnaire**

Participant Number:

Department:

No of Years working at the CCC:

Please tick on appropriate answer (s)

Demographic information

1. Respondent's gender?
   Male ☐
   Female ☐
2. What is your age?

18 – 22 ☐

21 - 30 ☐

31- 40 ☐

41-50 ☐

Above 50 ☐

Social-Economic information

3. What is your highest completed academic level?

Diploma ☐

Bachelors ☐

Masters ☐

Ph.D. ☐

5. What is your designation?

Doctor ☐

Clinical Officer ☐

Acceptability of EMR

1. Has your CCC installed an EMR? Yes ☐ No ☐
2. Do you use the EMR on a daily basis? Yes ☐ No ☐
3. Electronic medical records help clinic services improve efficiency

Yes ☐ No ☐ Don't know ☐

4. Which of the following do you think is/are benefits of Electronic medical records Circle any answer(s) you think is appropriate
    a) Able to provide access patient records any time
    b) Able to collect data and review quality performance
    c) Able to create efficiency in the clinic
5. Which of the following do you think are the disadvantages of Electronic medical records
    a) Inability to access patient records during power blackout YN
    b) Inability to access patient records when internet connection is poor
    c) Low level of computer literacy in staff
    d) Complicated systems requiring high level skills in computer usage
    e) Loss of Jobs in some departments
6. What do you think will be your personal challenge during the EMR implementation process
    a) I am not very conversant with using computers
    b) Patient management will take long due to use of the EMR
    c) Difficulties in accessing patient records

d) All of the above

Health Workers perceptions on utilization of EMRs in CCC services

Kindly tick as appropriate how you would rate the EMR

Key: **SD-strongly Disagree, D-disagree, N-Neutral, S T-Strongly Agree, A - Agree**

NO	**ITEM**	**Response**				
		SA	**A**	**N**	**D**	**SD**
1.	Access and speed					
2.	Ease of navigation					
3.	Efficiency					

4.	Personalization					
5.	Security/Privacy					
6.	User support					
7.	Assurance/Trust					
8.	User friendly interface					
9.	Reliability					
10.	Flexibility					

Organizational Factors and EMR Adoption in CCC

1. Which category is your facility? (1) Public [ ] (2) Private [ ] (3) F.B.O [ ]

27. Do you think the Level of the facility has influenced your decision to adopt EMR? (1) Yes [ ] (2) No [ ]

29. If yes, which facility is likely to adopt EMR in CCC services (1) Health Center [ ] (2) Hospitals [ ] (3) Dispensary [ ]

30. Do you have access to EMR facilities? (1) Yes [ ] (2) No [ ]

31. If yes, which ones? (1) Telephone [ ] (2) Email [ ] (3) Internet (Social Media) [ ]
32. Are you happy with the quality of the EMR systems in the facility you attend? (1) Yes [] (2) No [ ]

33. Do you think the quality of the systems influence your adoption of EMR? (1) Yes [ ] (2) No [ ]

34. What is the rate of information intensity in your facility? (1) High [ ] (2) Low [ ]

35. Do you think the intensity contributes to the level of EMR adoption by your facility? (1) Disagree [ ] (2) Agree [ ]

36. Do you find your facilities EMR systems adequately specialized/aligned to current services offered? (1) Yes [ ] (2) No [ ]

37. Do you think EMR specialization/alignment with the services being offered contributes to EMR adoption? (1) Yes [ ] (2) No [ ]

38. Is the management of the institution supportive of innovations? (1) Yes [ ] (2) No [ ]

39. If yes, does management support affect your willingness to adopt EMR? (1) Yes [ ] (2) No []

40. In your facility, do you use EMR facility voluntarily? (1) Yes [ ] (2) No [ ]

41. Do you think voluntary use of EMR facilities contributes to adoption? (1) Yes [ ] (2) No [ ] Explain your answer

42. On a scale of 1 – 5 (1 being very negative and 5 being very positive) rate the level of agreement at which you think EMR specialization/alignment has contributed to EMR adoption? Strongly Disagree [ ] (2) Disagree [ ] (3) Neutral [ ] (4) Agree [ ] (5) Strongly Agree [ ]

43. On a scale of 1 – 5 (1 being low intensity and 5 being very intense) rate the level at which information intensity contributes to EMR adoption (1) Very little [ ] (2) Little [ ] (3) Moderate [ ] (4) Much [ ] (5) Very Much [ ]

44. On a scale of 1-5 (1 being very negative and 5 very positive) rate the level at which use of EMR in the facility is voluntary (1) strongly Disagree [ ] (2) Disagree [ ] (3) Neutral [ ] (4) Agree [5) Strongly Agree [ ]

46. On a scale of 1 – 5 (1 being very negative and 5 being very positive) indicate the level of your satisfaction with the quality of EMR systems (1) Very Unsatisfactory [ ] (2) Unsatisfactory [ ] (3) Neutral [ ] (4) Satisfactory [ ] (5) Very Satisfactory [ ]

47. On a scale of 1-5 (1 being very negative and 5 very positive), rate the levels of agreement with the statement that 'adequate resources facilitate EMR adoption' (1) strongly Disagree [ ] (2) Disagree [ ] (3) Neutral [ ] (4) Agree [ ] (5) Strongly Agree [ ]

48. Do you think the facility you work in has adequate resources like financial and technology for factors on new technology?

a) Financial Resources? (1) Yes [ ] (2) No [ ]

b) Technological Resources? (1) Yes [ ] (2) No [ ]

E.3: Technological Factors and EMR adoption in CCC

49. Do you think by adopting EMR your facility will have relative advantage over others? (1) Yes [ ] (2) No [ ]

50. If yes, does relative advantage influence a facility's decision to adopt EMR? (1) Yes [ ] (2) No [ ]

51. Tick the likely benefits if your CCC adopts EMR.

Improved services e.g. ART, Services [ ]
Improved patient Satisfaction [ ]
Improved information Storage and retrieval [ ]
Improved service efficiency [ ]
Improvement in communication [ ]
Improvement of drugs and other supplies availability [ ]

52. Rank the extent to which the following factors enhance the adoption of EMR in your facility (Rank 1 being weakest and 5 strongest)

Complexity of facilities
(1) Very Weak [ ] (2) Weak [ ] (3) Neutral [ ] (4) Strong [ ] (5) Very Strong [ ]
Lack of compatibility of EMR facilities
(1) Very Weak [ ] (2) Weak [ ] (3) Neutral [ ] (4) Strong [ ] (5) Very Strong [ ]
Affordability of EMR
(1) Very Weak [ ] (2) Weak [ ] (3) Neutral [ ] (4) Strong [ ] (5) Very Strong [ ]
Information Security
(1) Very Weak [ ] (2) Weak [ ] (3) Neutral [ ] (4) Strong [ ] (5) Very Strong [ ]
Lack of improvement in the image of the facility
Very Weak [ ] (2) Weak [ ] (3) Neutral [ ] (4) Strong [ ] (5) Very Strong [ ]

E.4: External Environment

52. Rank the competition strengths of the facility you work in (Rank 1 – 5) (1) Very Weak [ ] (2) Weak [ ] (3) Neutral [ ] (4) Strong [ ] (5) Very Strong [ ]

53. Do you think adoption of EMR can enable the facility deal with competitive pressure? (1) Yes [ ] (2) No [ ]

54. In your Opinion does EMR adoption by other facilities influence your Organization to adopt EMR? (1) Yes [ ] (2) No [ ] Explain your answer_____

55. In terms of EMR, how does your facility compare with others? (1) Lagging behind [ ] (2) At par with others [ ] (3) Any other

_____

56. Given the scope and description of EMR as explained at the beginning of this questionnaire, do you think the government of Kenya has enacted enough laws and

policies to influence EMR adoption in CCC? (1) Yes [ ] (2) No [ ]

57.To what extent do you think government policies have affected EMR adoption in your CCC? (1) Not to a great extent [ ] (2) To a great extent [ ]
58. Do you think the government has developed adequate national EMR infrastructure? (1) Yes [ ] (2) No [ ]

59. If yes, do you find that infrastructure enough to support EMR adoption in CCC? (1) Yes [ ] (2) No [ ]

60. .Do you think there are any shared national values concerning EMR? (1) Yes [ ] (2) No [ ]

61. If yes, do you think that they contribute to your EMR adoption? (1) Yes [ ] (2) No
[ ]

62. In your opinion indicate the rate (1 being very little and 5 very much) at which the national culture affects EMR adoption(1) Very Little [ ] (2) Little [ ] (3) Moderate[ ](4)Much[ ](5) Very Much [ ]

63. The facility you work in has a lot of pressure from patients in need of services? (1) Yes [ ] (2) No [ ]

64. Do you think the pressure from patients has influenced EMR adoption? (1) Yes [ ]
(2) No [ ]

65. What recommendations would you suggest for EMR adoption in CCC?

Assessment of barriers/challenges faced in EMR implementation

Please respond to these questions as accurately and honestly as you can

1. Area of Management (Tick all areas appropriate)

   ☐ Clinical

   ☐ Information Technology

   ☐ Administration

2. Did you encounter any barriers /challenges in EMR implementation?

   ☐ Yes ☐ No (If response is No -end of questionnaire)

3. Which planning area in your opinion do you think should have received more attention?

a) Selection of EMR system

b) Phase out process of paper –based system to EMR system

c) Training and sensitization of staff on EMR.

d) Integration of EMR with any systems in place or with existing paper based system in larger hospital.

4. In the technical component which of the mentioned area (s) contributed to challenges in the implementation process

a) Internet connectivity Y ☐ N ☐

b) Numerous electrical supply shortages. Y ☐ N ☐

c) Difficulties in networking Y ☐ N ☐

d) Poor flexibility and adaptability of EMR to clinic flow Y ☐ N ☐

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Appendix III: Work Plan/Gantt Chart

Tasks	Duration (Days)	D	J	F	M	M	J	J	J	A	A	S	S
Proposal development	72												
Submission and approval of proposal	60												
Data collection	42												
Data entry and cleaning	21												
Data analysis	21												
Report writing	21												
Proposal defense	21												
Report finalization	21												
Final report submission	21												
Publication	30												

Appendix IV: Study Budget

Item description	**Unit cost(Ksh.)**	**No. of units**	**Total cost (Ksh.)**
Printing, photocopy and binding of draft proposal	400	6	2,400
Internet subscription	5,000	1	5000
Ethics Review Committee fee	2,000	1	2,000
Data analysis	10,000	1	10,000
Printing and photocopy of data collection tools	10	250	2500
Transport and lunch	100	30	3000
Printing, photocopy and binding of final study report	400	6	2400
Dissemination of findings	5000	1	5000
Grand Total			**32300**

Appendix V: List of facilities that have implemented EMR in Nairobi County

Health Facility Name	Facility Type	
Mbagathi DistrEMR Hospital	GOK	11
Kenyatta National Hospital	GOK	20
Ngara CCC	GOK	6
Amurt Health Center	GOK	5
Westlands Health Center	GOK	5
Kangemi Health Center	GOK	5
AccessAfya	Private	3
Pumwani Maternity Hospital	GOK	15
Spinal injury	GOK	6
STC CASINO	GOK	15
Remand	GOK	3
Makadara Health Centre	GOK	5
Uzima Dispensary	Faith Based	10
Mathare North HC	GOK	3
Kahawa West HC	GOK	3
St.Joseph Mukasa	FBO	10
St.Marys Langata	FBO	15
GSN St.Patel	Private	10
Avenue Hospital	private	20
Kayole 11	GOK	6
Mukuru mmc	Faith Based	7
Melkizedek Hospital	Private	3
Bahati HC	GOK	5
Jerusalem HC	GOK	6
Mukuru Reuben	Faith Based	7
MSF Kibera	Private	8
APTC - Administration Police	GoK	10
GSU-Embakasi	GoK	10
Langata Women Prison Dispensary	GoK	10
Nairobi West Men's Prison Dispensary	GoK	10
The Karen Hospital	Private	6
Kamiti Prison	GoK	10
NYS Dispensary-Kasarani	GoK	10
GSU-Dispensary Kasarani	GoK	10
Langata Hospital	private	7
Uhuru Camp Health Centre	GoK	5
Komarock Modern Medical Centre	Private	5
Radiant Hospital	Private	7
Annexclinix Nairobi West	Private	8
Mariakani Cottage	Private	10
St.Francis HC	Private	8
TOTAL		**332**