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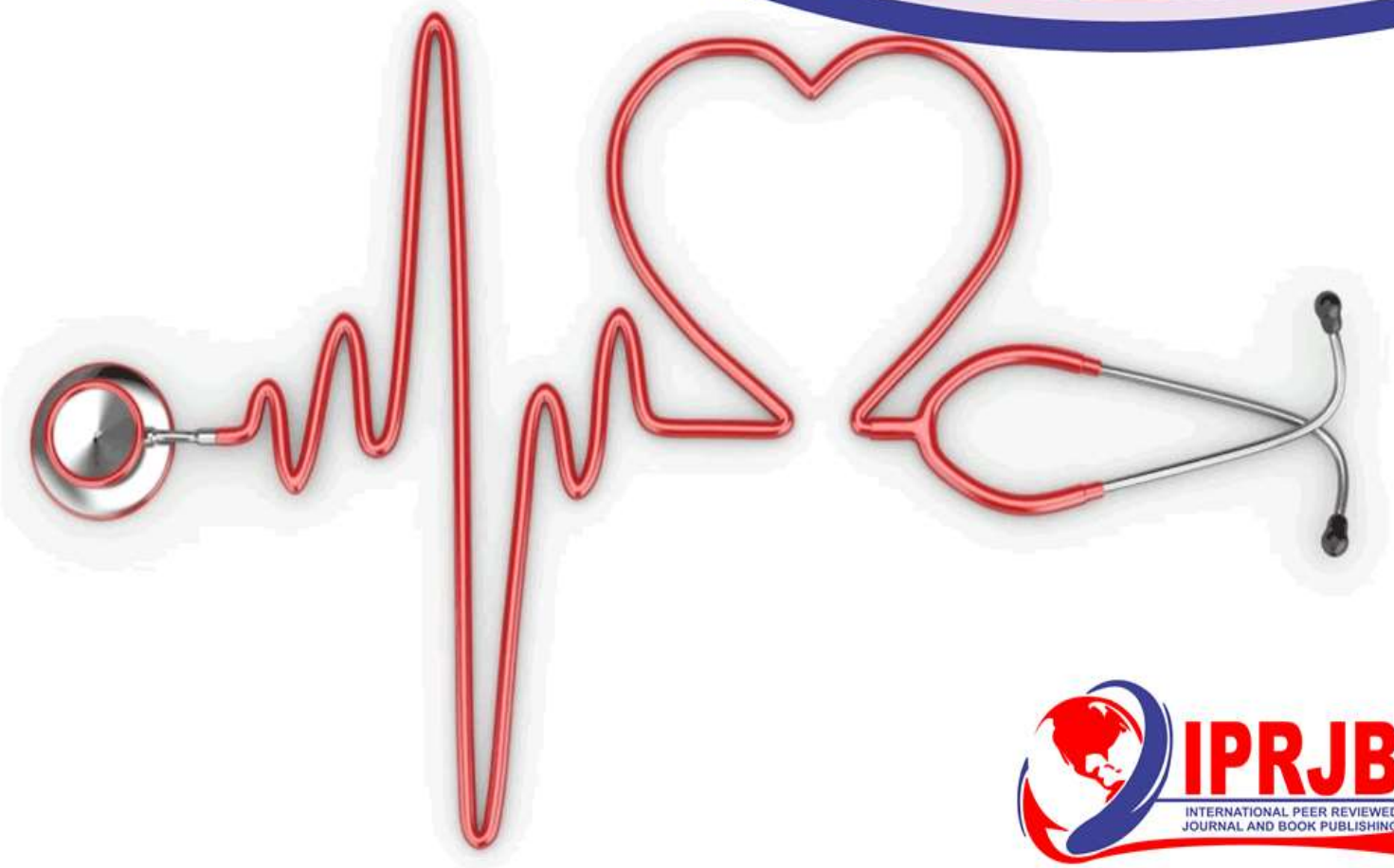

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Factors Associated With Adoption of Electronic Medical Record System among Healthcare Providers in Kirehe District Health Facilities, Rwanda

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Abstract

Purpose: The goal of this study is to determine the factors associated with adoption of EMR system among healthcare providers in Kirehe District health facilities. The study intends to answer a series of research questions about determining the level of EMR use among healthcare service providers, evaluation of the perception of healthcare providers towards medical care using EMR and the assessment of factors associated with the adoption of EMR system among healthcare providers in Kirehe District Health Facilities.

Methodology: The researcher used a cross sectional study design with quantitative approach. Thus, the researcher used census method, which involved the whole target population in the study as a sample size since the numbers of medical personnel in Kirehe District are manageable in terms of time and economy. The researcher used a questionnaire to collect data in this study. Chi-square test was used to assess the association between EMR system adoption and independent variables. The multivariable analysis was applied to identify factors associated with the EMR system adoption by considering the AOR, 95% and p-value less than 0. 05. Tables and Figure were also used to present the data.

Findings: The study findings showed that 25.8% of study participants had low, 36.0% had moderate while 38.2% had high levels of EMR use in Kirehe District Health Facilities. The percentage of adoption of EMR system at health facility was 38.2. Findings revealed that most of the study participants (86.8%) said they prefer using EMR rather than paper-based medical records. A big number (78.7%) of study participants believed that the quality of care is improved when using EMR. A lot of study participants (50.0%) strongly agreed that decisions about patient care are quickly taken based on electronic data. During the record of patient's data, most of the study participants (55.1%) agreed that errors are reduced while using EMR system. A big number of study participants (53.7%) strongly agreed that EMR system makes easy the generation of reports as it is automated and strongly agreed (57.4%) that the reports from the EMR system are accurate. Most of study participants (65.4%) strongly agreed that recording patient's data using EMR system saves time. A lot of study participants (95.6%) said that EMR use has a positive impact on patient care provision. Perception on reporting facilitation (easy generation of reports), EMR work use experience, data-driven decision-making and quality of internet were significantly associated with EMR system adoption among clinicians in Kirehe District Health Facilities. Clinicians who strongly agreed that EMR system eases reports generation were more likely to adopt the EMR system use (AOR=3.14, 95%CI: 1.128–6.023, p<0.001) compared to those who strongly disagreed. Clinicians who have used EMR system between 1 to 3 years were more likely to adopt EMR system use (AOR=4.23, 95% CI: 1.309–8.003, p=0.021) compared to those who have used the system for a period of less than 1 year. Clinicians who strongly agreed that EMR system supports in quick data-driven decision-making to improve patient's care were more likely to adopt the EMR system use (AOR=5.61, 95%CI: 1.829–11.864, p=0.022) compared to those who strongly disagreed. Clinicians who said that the quality of internet at the health facility was good during working hours were more likely to adopt EMR system use (AOR: 4.29, 95%CI: 1.005-7.879, p=0.002) compared to those who reported that the internet was unreliable.

Unique Contribution to Theory, Practice and Policy: The study should implicate the need for a holistic approach which combines technology (IT, modern infrastructure), people (capacity building and successful adoption), policy and planning that support sustainability of EMR usage to fully realize benefits of EMR in improving patient care and health data management in Kirehe district.

Keywords: *EMR System, Health Care Providers, Health Facilities, Adoption, Digital Health, Health Information Systems*

JEL Classification Code: *I18, 033*

INTRODUCTION

Effective medical care depends on timely and high-quality health information. The 1960s saw the introduction of electronic medical records, or EMRs for short. EMRs started out as a means for professionals to arrange their data, simplify ordering, cut down on repetitive tasks, and minimize errors brought on by subpar writing, among other things (Cheung et al., 2013).

For successful health care, high quality, timely health information is essential. EMRs (EMR), also known as Electronic Health Records (EHR), originally appeared in the 1960s. EMRs were developed as a way for specialists to organize their information, make ordering easier, eliminate repetitious activities, and reduce errors caused by bad writing (Amoroso et al., 2010).

The Mayo Clinic in Rochester, Minnesota was among the first major health systems to adopt an EMR. Since then, only biggest hospitals in partnership with health organizations could use them in scheduling and billing because it was expensive. One or more encounters in any healthcare delivery environment generate an electronic health record (EHR), which is a computer-based record of patient health data. It includes information on the patient's demographics, clinical history, vital signs, prescriptions, progress notes, vaccines, laboratory results, and diagnostic procedure reports (Desalu et al., 2019). In developed countries such as America, they were using Health Information Technology for Economic and Clinical Health (incentives for adoption in short period), but later long, they have had a plan to adopt electronic health record for long-term periods (Cucciniello et al., 2015). As a result, adoption among healthcare providers is slow, and acceptance rates vary widely, though remain low.

Employees tend to be reactive to constant change as a result of hospitals' growing aversion to fully accept technological change and increased limiting factors, making few user groups likely to adopt the new technology (Chishtie et al., 2023). As the quality of services provided deteriorates, it is likely that very little is contributed to the patients' well-being. When this happens, healthcare institutions are likely to be hesitant to implement EHR systems due to ongoing cultural opposition and poor organizational management, which can lead to poor work performance among health workers, a lack of job satisfaction, and poor service delivery, among other factors (Tissera et al., 2021). As a result, the rate of EHR adoption is quite low.

Over past decades the EMR systems has contributed to the improvement of medical care practices by enhancing healthcare delivery and facilitation health data decision-making process. EMR is more beneficial than paper records because it allows suppliers to track information over time, identify patients who are due for preventive visits and screenings, screen how patients compare to specific parameters such as vaccinations and blood pressure readings, and improve overall healthcare quality (Kruse et al., 2016).

Electronic health records (EHRs) are the foundations of every national health information system. Many developing countries have recognized that electronic health records can be an effective answer to many of their healthcare delivery difficulties (Bowman, 2013). Yet, significant issues persist. Some hospital cultures, for example, are resistant to technological change, resulting in poor technology adoption and utilization (Cheung et al., 2013); yet, effective spread requires user acceptability.

User resistance to transitioning from an existing health record system to a new system, such as from a paper-based health record (PBHR) to an Electronic Health Record (EHR), is one of the many tough difficulties that various scholars have attempted to define. Human skills, organizational structures, training, user confidence, culture, technical infrastructure,

inadequate financial resources, and coordination have all been blamed for the poor rate of adoption (Abbas et al., 2016). Several studies have also found that, despite rising interest in EHR deployment, the rate of acceptability in many poor countries remains low (Desalu et al., 2019).

The use of an EMR system (EMRS) allows health care workers to obtain, use, and communicate high-quality patient information. The successful use of EMRS improves the healthcare system and supports clinicians in providing patients with efficient and high-quality care (Sukarnoto & Cahyono, 2024). Nonetheless, despite emerging evidence of EHR's positive effects on hospital performance (Achampong, 2012), resistance to technological change among healthcare workers and various public health facilities is a significant impediment to successful EHR adoption and the delivery of high-quality patient care.

These factors range from technological to organizational to personal (Chishtie et al., 2023). Since 2005, Rwandan government in partnership with its partners have also adopted the use of EMR system to support clinical programs, pharmacy, acute care, labs and billing at health center level (Amoroso et al., 2010). The report of partners in health (PIH) has asserted that the adoption of EMR is still poor due to perception of the medical personnel who still prefers the paper-based system rather than paperless system (Amoroso et al., 2010). However, the Government of Rwanda through the ministry of health and RBC has decided to collaborate with PIH/IMB in the use of EMR system for supporting clinical programs, acute care, pharmacy, lab and Billing at HFs level (Amoroso et al., 2010) It is in this regard that the researcher aimed to assess the factors associated with adoption of EMRs among healthcare providers in Kirehe health facilities.

Low EMR adoption is prone to transcription errors, illegible handwriting and incomplete documentation and affect medical decisions. It has shown that implementation computerized physician order entry reduced serious medication errors by 55%. Bates, Leape, Cullen, et al. (1999). Manual system often delay access to diagnostic results, patients' histories and treatment plans, thereafter, affect timely clinical decisions. The world health organization (2016). Low EMR adoption restricts health system's capacity to collect, aggregate and analyze data for surveillance and public health planning. We found in Rwanda that EMR system like OpenMRS has improved reporting accuracy and monitoring of HIV and ART programs. (Rwanda Biomedical Centre, 2019).

Looking to barriers among different individuals such health care providers, it is revealed that technological and organization levels like low digital skills, infrastructure issues, leadership commitment affects much the electronic medical record adoption. (Bakele TA at al. 2024). When the EMR system is well used and record clearly timely, completely the patients' visits, there is an improvement in patient health status especially in patients with diabetes. In Rwanda, evaluation of T1D care before EMR implementation showed the improvement of HbA1C from 81.4 to t63.9 mmol/mol. (Bille N. etal. 2025). strong infrastructure, training, and monitoring are required but also using Systems with automated alerts significantly enhanced data quality. It has found in Cross-sectional study of 50 facilities that was conducted in Rwanda. (Fraser H. etal. 2024).

Statement of the Problem

Globally, over 50% of EMRs may fail or fail to be used effectively, there is gap between desired level of EMR use and its actual implementation especially in low income countries. In Rwanda primary health care services are the point of contact for patients, low adoption of EMR and

inability of clinicians to share and access health background information effectively lead to difficulties in providing adequate efficient and coordinated patient care at health centers. The adoption and efficient use of EMRs can promote that adequate management of different diseases at primary care level (Uwambaye et al., 2017).

In the United States, over 96% of hospitals and 78% of office-based physicians use certified EMR systems (Office of the National Coordinator for Health IT [ONC], 2023). In Europe, cross-border digital health strategies are supported through initiatives like MyHealth@EU. However, in many low- and middle-income countries (LMICs), adoption remains limited due to financial constraints, infrastructure gaps, and lack of technical capacity (Niazkhani et al., 2020).

EMR system deployment across Africa is progressing but remains inconsistent. Countries such as Kenya, Uganda, Ethiopia, and Zambia have implemented OpenMRS-based systems, especially in HIV and TB programs, often supported by international donors like PEPFAR and the Global Fund. Despite some progress, many African countries face barriers such as poor infrastructure, limited human capacity, and inadequate funding (World Health Organization [WHO], 2021; Niazkhani et al., 2020). These systemic limitations hinder sustainability and full integration into national health systems. The adoption is often donor-driven (e.g. PEPFAR, Global Fund). Highlighted key challenges include: Inadequate IT infrastructure, Poor internet connectivity, Limited technical expertise and funding. (Niazkhani et al., 2020). Rwanda is a leader in digital health innovation in sub-Saharan Africa. The Ministry of Health, in partnership with institutions such as Partners In Health (Inshuti Mu Buzima), has deployed a national EMR system based on OpenMRS. The EMR has been rolled out across district hospitals and health centers, focusing on HIV care, maternal and child health, and non-communicable diseases (Rwanda Biomedical Centre [RBC], 2019). The Rwanda Health Information Exchange (RHIE) ensures interoperability and supports national health data reporting (Binagwaho et al., 2015).

The adoption has improved patient tracking, clinical documentation, and data quality. For example, studies in Rwanda have demonstrated better diabetes management outcomes after EMR implementation, including significant reductions in HbA1c levels and improved visit frequencies (Chakrabarti et al., 2024).

In Kirehe district, located in Rwanda's Eastern Province, EMRs have been implemented in Kirehe District Hospital and affiliated health centers. These systems are primarily used for HIV care, maternal health, and non-communicable disease monitoring. The rollout was supported by Partners In Health and RBC as part of the national scale-up (RBC, 2019).

Despite these efforts, several challenges affect effective usage. A recent qualitative study noted inconsistent use of EMRs across facilities, limited digital literacy among staff, and infrastructural problems such as internet instability and power interruptions (Habineza et al., 2024).

LITERATURE REVIEW

Theoretical Framework

Activity Theory

Leontiev first developed the framework of activity theory in 1974 who stipulated about older adults and maintaining social interactions as a successful aging (Sukarnoto & Cahyono, 2024).The activity theory is also used as tools to analysis the data of the patient in health

facilities and evaluation of information systems and technologies that are applied in maintaining social interaction between patient and healthcare provider.

The activity theory is a descriptive framework, a thought and a theoretical approach or a viewpoint which is used to analyze human pastime from needs based and aim oriented viewpoint to emphasize the social interaction through use of centralized healthcare with the use of internet accessibility to increase adoption of EMR system among clinicians to reduce paperwork and save time for the patient. The healthcare industry's transition to electronic health records has raised concerns about security and privacy.

Patient health information leaks have become a concern for healthcare providers, insurance companies, and pharmacies because leaks of patient data can lead to violations of privacy laws, which protect the privacy of individuals' identifiable health information, potentially resulting in a healthcare crisis (Cheung et al., 2013). Therefore, this study of activity theory brings the idea of centralized health care system as technological factors to facility the interaction between the medical staff and the patient data, the security factors that enhance protection the patient record and individual factors where the medical and health personnel have to be familiar with the system to ensure success of the health facility (Ajami & Bagheri-Tadi, 2013)

Activity Theory is a framework from psychology and education that examines human behavior within the context of tools, goals, social roles, and the environment (Engeström, 1987). In EMR adoption, Activity Theory helps explain how clinicians interact with electronic systems as part of their daily work practices and how these systems can both enable and disrupt clinical workflows. Some examples of Clinician behavior explained by activity theory are that Clinicians rely on EMRs to document care. If the EMR is poorly designed or unintuitive, it may interrupt their cognitive flow, leading to frustration or workarounds (e.g., jotting notes on paper to enter later). Activity Theory highlights how conflicts between the tool (EMR) and rules (clinical guidelines or time constraints) can cause resistance. For instance, a nurse may find that EMR-required fields slow down patient intake in emergencies—leading to skipped entries or data inaccuracy. Over time, EMRs can transform the activity system. A clinician who initially resists EMRs may later see benefits in features like drug interaction alerts, leading to more evidence-based prescribing behavior (Yusof et al., 2008).

This theory how tools like EMRs mediate the subject's actions. Poorly designed EMRs often create friction in clinical tasks, leading to non-use or workarounds. It is confirmed with Koppel et al. (2008) who found that when barcode-based EMR medication systems conflicted with nurses' workflow, staff created workarounds, some of which compromised patient safety. Activity systems evolve. To mean Clinicians who once resisted the EMR began using features like decision support tools when they saw benefits for patient safety and was emphasized using activity theory to explore EMR implementation in Chinese hospitals where they found that initial resistance turned into acceptance when EMR use was aligned with clinicians' goals and supported by adequate training and peer engagement. (Tang et al. 2021)

Diffusion Theory

The framework of diffusion theory explores the process of change and combines components of innovative ideas (Kruse et al., 2016). Medical workers who use the diffusion hypothesis may encounter pushback from those who are reluctant to change. Additionally, Scott and McGuire state that the adoption phase begins when a user accepts the innovation and ends when the desire diminishes. Users evaluate a system or concept to determine whether moving forward is the best option. The diffusion of innovation hypothesis supports health facility leaders in

implementing new ideas, developing communication channels, and offering techniques to successfully obtain patient information (Kruse et al., 2016).

Therefore, the adoption of EMR system by clinicians is a way of bringing innovation to medical field (Kruse et al., 2016). The Bass model of innovation diffusion theory assumed that patient data potential remained constant throughout the diffusion, with new system attributes acting as internal factors and user characteristics acting as functions of external factors, and taking into account possible changes in patient attitudes and expectations of services (Sukarnoto & Cahyono, 2024). The influence of word-of-mouth communication on patients or guardians' decision-making is considered as a paramount feature of this theory of diffusion (Isemeck et al., 2019). By introducing the model of EMR system facilitates the medical personnel to communicate the results of the findings from the medical laboratories to the doctors who have to prescribe the medicines to the patient and as well as communicating the patient data in smooth and very easy manner (Abbas et al., 2016). Thus, this theory of diffusion is very relevant to this field of public health specifically in the application of EMR systems.

Diffusion of Innovations (DoI) Theory

This theory was developed by Everett Rogers (2003), explains how new technologies, practices, or ideas are communicated and adopted within a social system over time. In the context of healthcare, particularly regarding Electronic Medical Record (EMR) system adoption, the DoI theory provides a useful framework to understand how and why clinicians and healthcare organizations choose to adopt or reject such systems. Let's relating to core constructs:

Relative Advantage

This refers to the degree to which an innovation is perceived as better than the idea or system it replaces. In EMR context: Clinicians are more likely to adopt EMRs if they believe it improves efficiency, patient safety, and documentation quality over paper records. Example: Studies have shown that EMRs reduce medication errors and improve chronic disease monitoring (Bates et al., 1999).

Compatibility

This is the extent to which the innovation aligns with existing values, past experiences, and needs of potential adopters. In EMR context: EMRs that match existing clinical workflows, documentation habits, and professional roles are more likely to be accepted. Example: Clinicians resist EMRs that disrupt their routine or feel inconsistent with patient-centered care models (Lapointe & Rivard, 2005).

Complexity

This refers to how difficult the innovation is to understand or use. In EMR context: If the EMR system is perceived as overly technical or difficult to navigate, adoption rates will likely decline. Example: A study found that clinicians cited user-unfriendly interfaces and steep learning curves as major barriers to adoption (Boontarig et al., 2012).

Trial Ability

The ability to experiment with the innovation on a limited basis before full implementation. In EMR context: Health workers are more open to adopting EMRs when pilot programs or sandbox environments are provided, allowing them to learn without pressure. Example:

Hospitals that provided sandbox environments before rollout reported smoother transitions and higher acceptance (Gagnon et al., 2012).

Observability

The extent to which the results of using the innovation are visible to others. In EMR context: When clinicians can clearly see the positive outcomes of EMR use (e.g., better audit trails, easier access to labs), they are more likely to adopt. Example: Visibility of improved patient documentation and successful use in other departments fosters peer-driven adoption (Yarbrough & Smith, 2007).

In summary; Diffusion of Innovations (DoI) theory explains how innovations like EMRs are adopted based on perceptions of key attributes. i.e.: Nurses in Kirehe may reject EMRs if they see them as complex and misaligned with their daily routines, even if technically available. (Rogers, 2003). Activity theory focuses on how people use tools such EMRs to achieve objectives within a system of rules and community. i.e.: Tensions arise when nurses are expected to enter EMR data, but lack computer training, creating contradictions between tool use and role expectations**.** (Engeström, 1987). Division of Labour Theory explains specialized tasks and responsibilities are divided in systems, influencing cooperation and efficiency. i.e.: If clinicians perceive EMR documentation as adding to their clinical workload without support, resistance to adoption may increase. **(**Durkheim, 1893).

DoI theory's five core attributes of innovation; relative advantage, compatibility, complexity, trialability, and observability were used to structure the questionnaire and interview guides. Each construct was operationalized as a measurable item to assess healthcare providers' perceptions. This theoretical alignment ensured construct validity of the instrument and allowed for a structured analysis of perceived innovation characteristics. (Rogers, 2003).

Conceptual Framework

Conceptual framework refers to the diagram demonstrating the relationship between the independent variables, dependent variable and the moderating variable. In the case of the current study conceptual framework is based on technological, security and individual factors as the independent variables, EMR system as dependent variables and power supply as the moderating variable, which can falsify the information given by the independent variables if not well controlled.

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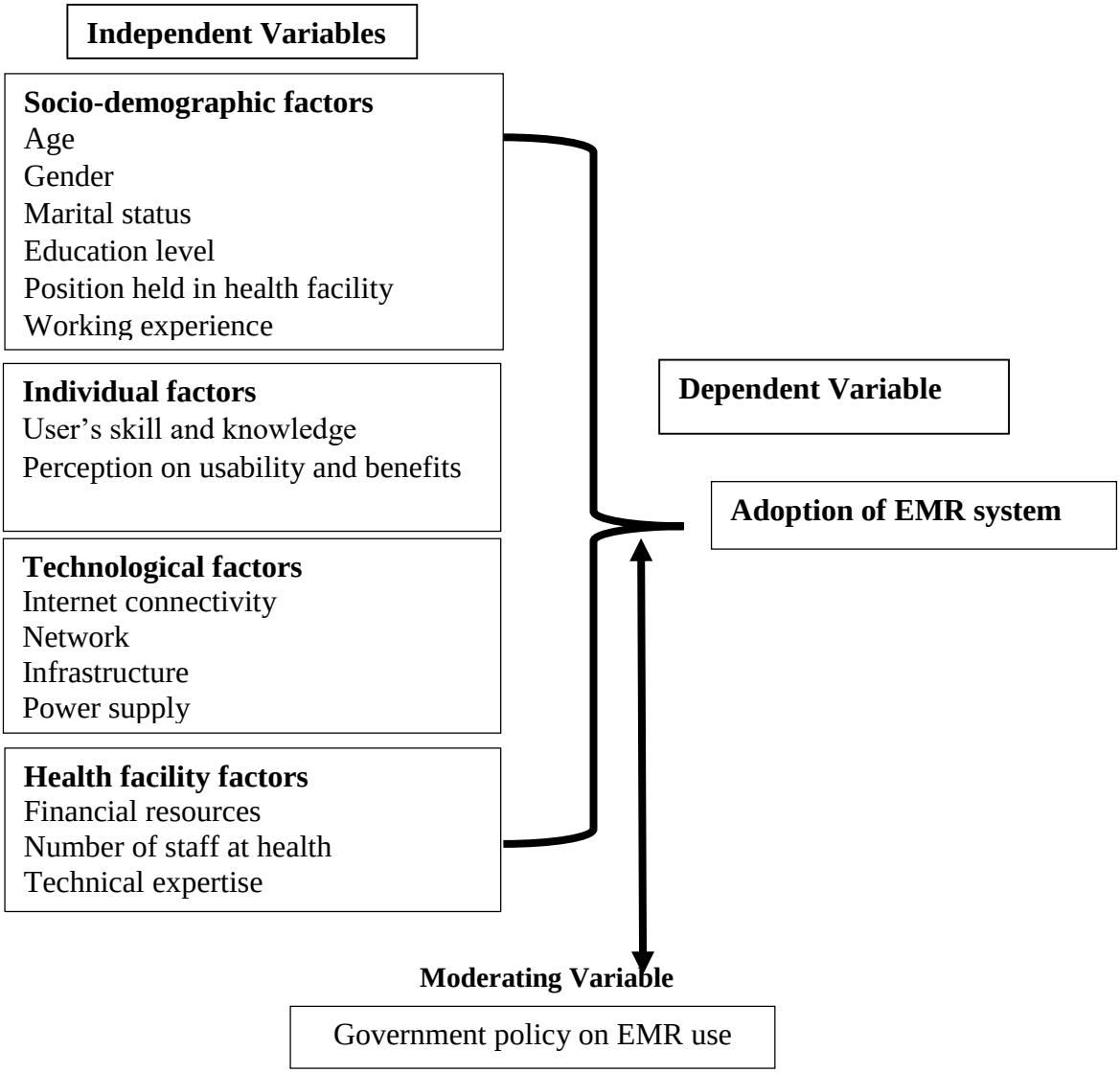

Figure 1: Conceptual Framework

Source: Researcher

The Figure 2.2 demonstrates the association between the variables of the study, which are the independent variables (so1cio-demographic, individual, security and technological factors and dependent variable that is EMR system. Thus, the first independent variable is socio-demographic factors, which have metrics like education level, position help in health facility and working experience.

The second independent variable is individual factors, which have metrics like skill and knowledge of the user, perception of the user and satisfaction of the user. The third independent variables is security factors which have metrics such as protection of patient data, preservation of medical records and destruction of medical records to ensure confidentiality of the patient data. The fourth independent variable is technological factors, which has metrics such as centralized healthcare system, internet connectivity and network in the health facility.

The dependent variable is EMR while the moderating variable is power supply because the power supply can affect negatively or positively the use of EMR system when the power is

supplied or not supplied, the system has to consume power in order to work. Thus, this factor has to be controlled in this study so that it should not affect EMR system rather than the technological, security and individual factors doing the same.

Empirical Review

The Level of Use of Electronic Medical Record System

Internationally, EMR use is classified into three levels: not implemented, moderately implemented, and fully or completely deployed. Full implementation refers to the use of EMR in all services within institution, partial use takes place when there are some services that still use paper based whereas no implication occurs when all services within organization use only paper based approach in recording patient information (Isemeck et al., 2019). A study in Hong Kong that assessed the usability of EMR revealed that EMR adoption level were 83.3% and 76.6% among family medicine specialists and general practitioners respectively, the proportion of both specialists and non-specialist as recognized by Hong Kong academy in using EMR were 81.0% and 79.1% respectively and the average of using computers were 7years (Cheung et al., 2013).

The Perception of Participants towards Quality of Care using EMR

The Deloitte Center for Health Solutions 2013 has found that most American physicians in primary care perceive EMR efficiencies in terms of faster and more accurate billing with time saving through e-prescribing as the principal benefits of health information recording. In general, American primary physicians who use EMR, are optimistic about its prospects for better care and lower administrative costs once fully integrated. Furthermore, nearly 75% of those polled believed that these applications could reduce errors. 70% thought EMR had the potential to increase their productivity. Over 60% of respondents indicated that EMR systems have the potential to reduce costs and assist patients in taking on more responsibility (Sukarnoto & Cahyono, 2024).

Another study in America reveled that EMR systems improved efficiency and quality. The cost of charts pulls had been eliminated which reduced the cost EMR perceived that they received support regarding drugs selections. The EMR users perceived that the system had brought huge changes such as identifying the least expensive drugs within a class, which reduced the drug cost by 18%. The same study revealed that EMR through displaying charges for tests and results helped independently in the reduction of laboratory test by 10-15%. Doctors thought that by quickly evaluating problems, prescriptions, and recent notes in the EMR, they could immediately gain a feel of their patients' problems. Furthermore, patients benefit from the computerization of reminders and prevention guidelines. Reminders are also useful in the treatment of chronic conditions such as diabetes, and computerization of medication prescribing improves safety by reducing medication errors by more than 80% (Desalu et al., 2019).

A cross-sectional study in Malawi reported that the majority of respondents (67.6%) thought EMRs were faster and easier to use than paper-based records. 77.8% thought the EMR system provided more accurate information and treated patients faster than the paper-based records system. EMRs ensured the privacy and security of patient information, according to 76.9% of respondents. EMRs, according to participants, allowed health personnel to generate more accurate information, access patient information more rapidly, and they were happy with notifications and warnings about vital patient and prescription information. This minimized

medical errors and enhanced decision-making in patient management. EMRs also enabled clinicians to evaluate a greater number of patients (Sprogis et al., 2023).

The results of the empirical study conducted on the physician's attitude and perceptions towards EMRs have revealed that 109 (82.0%) of respondents asserted that the use of EMRS boosts security while 107(80.4%) of respondents asserted EMRs affect privacy concerning patient data.

According to the same study, a considerably higher number of physicians (94% vs. 86%) said they needed access to inpatient data versus outpatient data. Just almost half of the respondents (50.4%) said they used a computer every day, while only 23 (17.3%) of physicians did not. Physicians' computer skills were rated as good by 53 (38.9%), moderate by 64 (48.1%), and poor by 16 (12.1%) (Yehualashet et al., 2021). The study conducted among clinicians perception on the use of EMR within referral hospital in Kigali had found that the majority (90%)of the participants were satisfied with EMR and showed the positive perception of EMR use in quality of care while only a 10% did not perceive any advantage of a computer-based EMR and prefer paper based records in clinics (Uwambaye et al., 2017).

A study conducted in Rwanda on the perceived benefits and barriers to the use of EMRs among eight health centers level in Kigali, with use of a cross-section research design revealed that the majority (85%) of users agreed that the generation of reports from EMRs was easily, it help to retrieve the patient data in a timely manner for example CD4 level and can improve significantly the quality of health care delivery. However, 53% of participants disagreed that EMR provide information about patient. In same study the proportion of perception of the EMRs usage as a double work to professional has been calculated, and chi-square was statistically significant (P=0.003). 50% of participants thought that the quality of health care has significantly improved, while 42.3% of participants reported that the quality of health care improved a little, and 7.7% thought that there was no change in improvement of quality of health care (Kruse et al., 2016).

Factors Associated with the Adoption of EMR System among Healthcare Providers in Health Facilities

Individual Factors Associated with EMR Adoption

Countries such as the United States, Australia and United Kingdom have advanced infrastructures that receive substantial funding and support from their government and international health organization although significant failures in the EMR exist. Nurses' acceptance of computer use was discovered to be one of the factors associated with EMR system adoption and essential to successful implementation.

Early studies assessed nurses' attitudes toward computers in relation to years of education and years of nursing experience. The findings revealed that nurses with advanced education had a more positive attitude toward computer use, whereas nurses who had been nurses for years had a negative attitude toward the use of EMR. The same study discovered that nurses' confidence in using technology was lower than expected, particularly in relation to software applications (Ajami & Bagheri-Tadi, 2013). One of the barriers to EMR adoption was a lack of computer application knowledge.

The majority of health care personnel in developing countries lack the fundamental computer knowledge or abilities needed to use EMR successfully. Fear of making mistakes when skills and typing speed into the system may be delayed, negative perception of EMR use since the

perception of a new technology is based on how it is conceptualized, adopted, and used efficiently. However, nurses had insufficient knowledge of information technology and the resistance to change from paper based records. Thus, the researcher recommended that effective adoption of EMRs has to be reinforced by empowering the IT managers with medical knowledge, health care providers with computer skills, and providing necessary equipment at all the health institutional levels in Rwanda (Uwambaye et al., 2017).

Technological Factors Associated with EMR Adoption

The availability of healthcare infrastructure such as computers, software, and interconnectivity has increased in developed countries such as Finland, Denmark, Sweden, and the Netherlands, resulting in a high rate of adoption; however, one of the major challenges to technology adoption in developing countries is a lack of infrastructure to support the requirement for health information (Cheung et al., 2013).

Hardware and software incompatibility is another technological factors, lack of internet connectivity had been another factor where in 2011 that only 26% of individuals in developing world were connected to the internet. In developing countries, unstable power supply has been major challenge especially in health facilities because most of them has no mains power and where available, Such power is extremely unreliable, posing a risk to unprotected electronic equipment (Ajami & Bagheri-Tadi, 2013) Chepkwony (2015) examined variables affecting the adoption of EMRs technology in Kenyan public health facilities using a cross-sectional survey approach and a case study of hospitals in Nairobi County. The study's findings on the relationship between network accessibility and EMR technology adoption yielded $p=0.836>0.05$, implying that there is no significant relationship between network accessibility and EMR adoption in Kenyan public health institutions (Abbas et al., 2016).

Organizational Factors Associated with EMR Adoption

Financial resources, training support, technical expertise, and human workforce are examples of organizational factors that may influence the adoption of EMR use for health care delivery within a given health care facility. Inadequate resources for purchasing new computers or maintaining existing ones. Low EHR adoption in Sub-Saharan Africa has been linked to high implementation costs due to hardware, software, and training expenditures, a lack of training, a demanding workload, insufficient technological skills, and significant employee turnover, according to research (Berihun et al., 2020). The study's findings on the association between staff education and competencies and EMR technology adoption found a $p=0.151>0.05$, indicating that there is no meaningful relationship.

However, the same study's findings on the relationship between resource availability and EMR technology adoption revealed a $p=0.0270.05$, indicating that there is a significant relationship between resource availability and EMR technology adoption. Consequently, based on the study's findings, the researcher advised health facilities to expand infrastructure and resources to support EMR use, as well as increase trainings for medical personnel on how to use EMR technology (Isemeck et al., 2019)

Research Gaps

The studies reviewed had concentrated on barriers and challenges to the adoption of EMR technology in public health institutions in Rwanda and on the perceived benefits to the use of EMRs in hospitals, however it took less attention to the determination of level at which the EMR is used among clinicians at health center level. The perceptions of clinicians towards the

quality of care also had not been taken into consideration and possible factors that might influence adoption of EMR among Kirehe clinicians have not been studied on. Therefore, this study addressed the three gaps found in the reviewed literature

METHODOLOGY

Methodology of this research has dealt with research design, target population, sample size, sampling technique, data collection methods, data collection instruments, procedures of data collection, the validity and reliability of instruments, data analysis and ethical consideration that is based on the ethical principles of conducting, process and storing data until final use.

Research Design

The researcher used cross sectional research design with quantitative approach to collect data from clinicians using EMR system of health centers in Kirehe District.

Target Population

136 healthcare service providers in Kirehe health facilities composed the target population of this study. The target population included clinicians working in NCDs (Non-communicable diseases), mental health, HIV clinic and pediatric Development clinic and other staff using EMR system.

Table 1: Target Population

Health Center	From NCDs	From MH	From PDC	From HIV
Bukora Health Center	2	2	2	2
Gahara Health Center	2	2	2	2
Gashongora Health Center	2	2	2	2
Kabuye Health Center	2	2	2	2
Kigarama Health Center	2	2	2	2
Kigina Health Center	2	2	2	2
Kirehe Health Center	2	2	2	2
Mahama Health Center	2	2	2	2
Mulindi Health Center	2	2	2	2
Musaza Health Center	2	2	2	2
Mushikiri Health Center	2	2	2	2
Nasho Health Center	2	2	2	2
Ntaruka Health Center	2	2	2	2
Nyabitare Health Center	2	2	2	2
Nyarubuye Health Center	2	2	2	2
Rusumo Health Center	2	2	2	2
Rwantonde Health Center	2	2	2	2
Total	34	34	34	34

Source: Kirehe District Health Office, 2021

The Table 1 indicates that Kirehe District health facilities have 136 healthcare providers who use the EMR in the care provision of the patients.

Sample Size

Sample Size Determination

To determine the number of the respondents, the researcher used total sampling (census) since the number of target population is manageable with time and finance of the researcher, which implies that the whole of 136 participants have been employed in the study.

If I use the sample size, I would have used Yamane sample size calculation (n = N/1 + Ne^2) but I used the whole population study.

Sampling Technique

The researcher used census method as a sampling technique since the target population of this study was used as the sample size since the number of 136 medical and health personnel are manageable within time and finance of the researcher.

Data Collection Methods

Data Collection Instruments

This research used a structured questionnaire to collect the information from the field. It was separated into three parts: part one covered the socio-demographic characteristics of respondents, part two covered aspects connected to EMR use, and part three covered questions about the use and perception of EMR and its advantages on clinical treatment.

Procedures of Data Collection

Data was collected using the questionnaire that was distributed to 136 participants. Prior to data collection, the researcher has sought ethical approval and consent from respondent. To collect information from the field, a questionnaire was used. The researcher advised the respondents that the research was conducted for academic objectives, assuring them that the material obtained throughout the research process was not used for personal advantage or in violation of academic ethics. The questionnaire was translated into Kinyarwanda and distributed for completion to respondents who were not comfortable with English version.

Validity and Reliability of Instruments

The Reliability of the data collection refers to the measurement of its stability and the degree at which its measurement reflects the underlying reality is referred to as validity.

The consistency of the tool's outcomes across several research indicates how reliable it is. A questionnaire was used for data collection in the present study. It was pretested for 10 clinicians from Kayonza District Health Facilities. To ensure its reliability, the collected data from those clinicians were entered into SPSS, computed the Cronbach's Alpha Coefficient, and then was interpreted. The questionnaire was approved to be reliable as the alpha coefficient was greater than 0.7. The questionnaire's validity was determined by the same data from the pilot study by calculating the Pearson's correlation coefficient. The interpretation of values was done after checking all items of the questionnaire one by one. It was confirmed valid, as the obtained value was greater than the value in Pearson r table.

Data Analysis

Data was analyzed quantitatively. Data collection tool was checked to confirm their fully completeness before coding and data related to level of use was extracted from the EMR system tool that auto-calculates users data entry status percentage for every user and classified

according to district health level agreement as low(<50%) , middle(50-84%) and high(85+) with health facilities and partners whereas the adoption consists of level of only high(85+). Data was entered and cleaned using Excel then imported and analyzed using the Statistical Package for Social Scientists (SPSS) version 21.0 software. The descriptive statistics was used to determine the use of EMRs among clinicians. The grading of the perception level was carried out by Likert scale. Factors associated with the adoption of EMR and its users' perception was analyzed using bivariate and multivariate analysis. Odd ratio (OR) with 95% CI were applied to establish strong relationship. The findings were considered to be statistically significant for the p-value <0.05. Thus, the presentation of findings was made through use of text and tables.

Ethical Consideration

Before conducting the study, the researcher sought for Ethical Clearance from Mount Kenya University, Rwanda, Institutional Review Board (IRB) and approval from Kirehe District Hospital Leadership. Then, the researcher met the respondent for introduction and aim of the study and health personnel willing to participate expressed their consent. The researcher assured the respondents that their information has been treated with confidentiality, and they had right to withdraw anytime.

RESULTS

This results present socio-demographic characteristics of respondents, study findings, and discussion. The findings here are presented according to the study specific objectives. The total number of respondents was 136 EMR users from seventeen health facilities in Kirehe District. They were all reached and interviewed; the study participation rate is a hundred percent

Socio-demographic characteristics of respondents

The socio-demographic characteristics of study participants included respondent's age, gender, marital status, job title, education level, working experience and EMR use work experience.

Table 2: Socio-Demographic Characteristics of Participants

Variables (%)	Frequency (N=136)	Percentage
Age (Years)		
<25	11	8.1
25-35	56	41.2
36-45	51	37.5
46+	18	13.2
Gender		
Male	69	50.7
Female	67	49.3
Marital status		
Single	30	22.1
Married	101	74.3
Divorced	2	1.5
Separated	2	1.5
Widowed	1	0.7
Position or Job title		
Nurse	63	46.3
Midwife	17	12.5
Head of service	24	17.6
Head of health center	15	11.0
Other	17	12.5
Education level		
Secondary	27	19.9
Advanced diploma A1	45	33.1
Bachelor	61	44.9
Masters	3	2.
Working experience (years)		
Below 5	60	44.1
6-10	34	25.0
11-15	29	21.3
16+	13	9.6
EMR use work experience (years)		
Below 1	27	19.9
1-3	97	71.3
4-6	11	8.1
7+	1	0.7

Source: Primary Data, 2024

Findings in Table 2 revealed that most of participants (41.2%) were aged between 25-35 years. The mean age was 34.6 years. Most of participants were male (50.7%). A lot of them were married (74.3%). Most of participants were nurses (46.3%). Most of them had bachelor degree (44.9%). Most of participants had ≤ 5 years of working experience (44.1%). A big number of participants had between 1-3 years of EMR working experience (71.3%).

The findings of this study are presented in both tables and figure according to its three study specific objectives that consist on determining the level of use of EMR among healthcare

providers in Kirehe health facilities (Table 3, Figure 2), evaluating their perception towards medical care using EMR (Table 4) and assessing the factors associated with the adoption of EMR system among them (Table 5).

Level of Use of EMR among Healthcare Providers in Kirehe District HFs

Table 3: Level of Use of EMR among Healthcare Providers in Kirehe District HFs

Variables	Frequency (N=136)	Percentage (%)
Level of EMR use		
Below 50	35	25.8
50-84	49	36.0
85+	52	38.2

Source: Primary data, 2024

The study findings in Table 3 showed that 25.8% of study participants had low, 36.0% had moderate while 38.2% had high levels of EMR use in Kirehe District Health Facilities. However, in Kirehe HFs, those with low and moderate level of use are categorized as not adopted whereas those with high level as those who have adopted EMR system use

The study findings in Figure 2 showed that 52 (38.2%) participants adopted the use of EMR system while a big number, 84(61.8%) did not in Kirehe District Health Facilities.

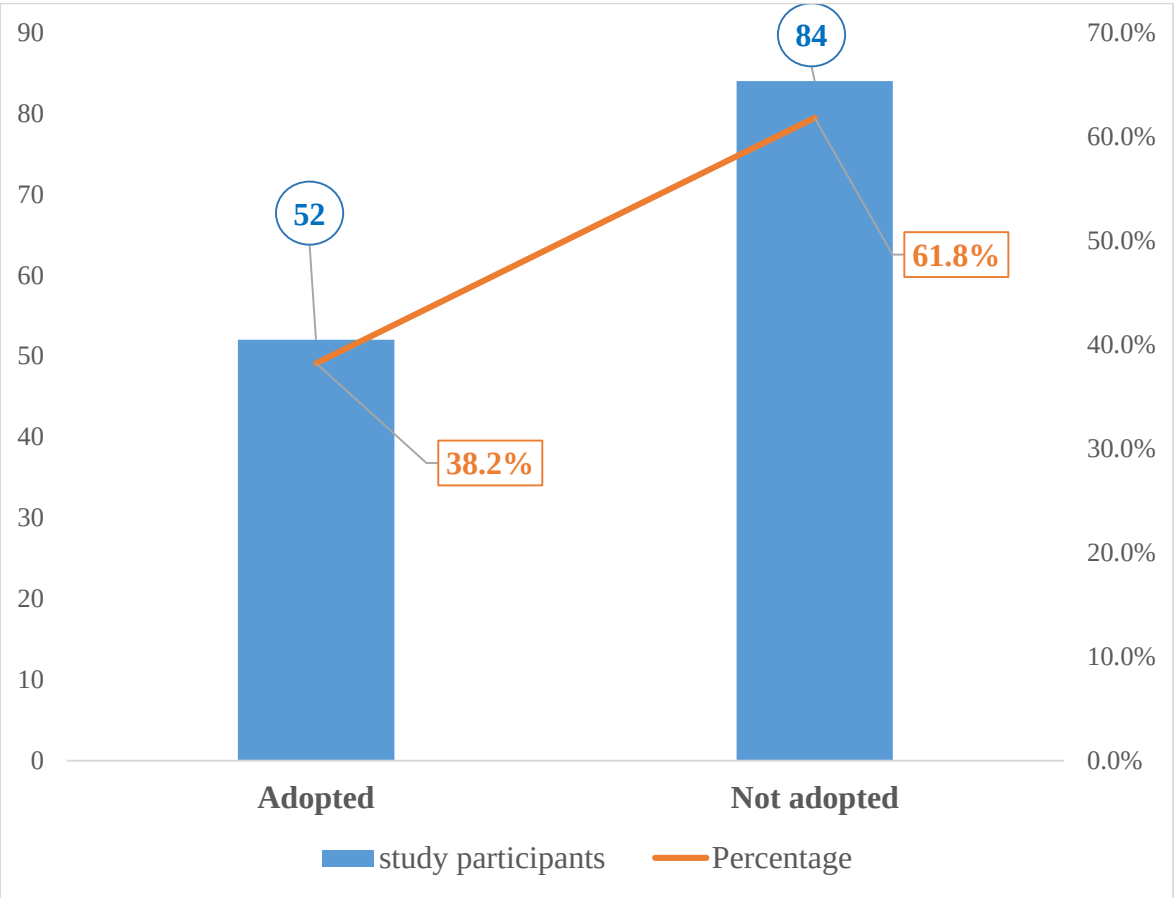

Figure 2: Adoption of EMR system among healthcare providers in Kirehe District Health Facilities

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Perceptions of Healthcare Providers towards the Use of Medical Care using EMR

Table 4: Perceptions of Healthcare Providers towards Use of Medical Care using EMR

Variables	Frequency (N=136)	Percentage (%)
Preference of using EMR Versus Paper-based record		
EMR	118	86.8
Paper record	18	13.2
Beliefs about quality of care improvement while using EMR		
Significant improvement	107	78.7
Only little improvement	26	19.1
No improvement	3	2.2
Perception on quick data driven decision-making		
Strongly agree	68	50.0
Agree	50	36.8
Neutral	10	7.4
Disagree	8	5.9
Strongly disagree	0	0.0
Perception on reduction of medical record errors		
Strongly agree	45	33.1
Agree	75	55.1
Neutral	14	10.3
Disagree	2	1.5
Strongly disagree	0	0.0
Perception on reporting facilitation (generation of reports)		
Strongly agree	73	53.7
Agree	34	25.0
Neutral	22	16.2
Disagree	7	5.1
Strongly disagree	0	0.0
Perception on generated reports accuracy		
Strongly agree	78	57.4
Agree	37	27.2
Neutral	16	11.8
Disagree	5	3.7
Strongly disagree	0	0.0
Perception on time saving while using EMR		
Strongly agree	89	65.4
Agree	36	26.5
Neutral	2	1.5
Disagree	8	5.9
Strongly disagree	1	0.7
Perception on impact of EMR use on care provision		
Positive	130	95.6
Negative	4	2.9
None	2	1.5

Source: Primary Data, 2024

Findings in Table 4 revealed that most of the study participants (86.8%) said they prefer using EMR rather than paper-based medical records. A big number (78.7%) of study participants believed that the quality of care is improved when using EMR. A lot of study participants (50.0%) strongly agreed that decisions about patient care are quickly taken based on electronic data. During the record of patient's data, most of the study participants (55.1%) agreed that

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errors are reduced while using EMR system. A big number of study participants (53.7%) strongly agreed that EMR system makes easy the generation of reports as it is automated and strongly agreed (57.4%) that the reports from the EMR system are accurate. Most of study participants (65.4%) strongly agreed that recording patient's data using EMR system saves time. A lot of study participants (95.6%) said that EMR use has a positive impact on patient care provision.

Factors Associated With Adoption of EMR System among Healthcare Providers in Kirehe District Health Facilities

Socio-demographic Factors Associated with Adoption of EMR System Use

Table 5: Bivariate Analysis of Socio-Demographic Factors Associated With Adoption of EMR System Use

Variables	Adoption of EMR system use (N=136)		Pearson Chi-Square (χ^2)	P-Value
	Adopted (N=52) N(%)	Not adopted (N=84) N(%)		
Age (years)			6.201	**0.102**
<25	2(18.2)	9(81.8)		
25-35	26(46.4)	30(53.6)		
36-45	15(29.4)	36(70.6)		
46+	9(50)	9(50)		
Gender			5.074	**0.024**
Male	20(29.0)	49(71.0)		
Female	32(47.8)	35(52.2)		
Marital status			8.045	0.090
Single	15(50.0)	15(50.0)		
Married	33(32.7)	68(67.3)		
Divorced	1(50.0)	1(50.0)		
Separated	2(100)	0(0.0)		
Widowed	1(100)	0(0.0)		
Education level			10.653	**0.014**
Secondary	4(14.8)	23(85.2)		
Advanced diploma	24(53.3)	21(46.7)		
Bachelor	23(37.7)	38(62.3)		
Masters	1(33.3)	2(66.7)		
Position or job title			3.022	0.554
Nurse	21(33.3)	42(66.7)		
Midwife	8(47.1)	9(52.9)		
Head of service	8(33.3)	16(66.7)		
Head of HC	6(40.0)	9(60.0)		
Other	9(52.9)	8(47.1)		
Working experience (years)			1.861	0.602
Below 5	25(41.7)	35(58.3)		
6-10	14(41.2)	20(58.8)		
11-15	10(34.5)	19(65.5)		
16+	3(23.1)	10(76.9)		
EMR use experience (years)			4.620	**0.042**
Below 1	6(22.2)	21(77.8)		
1-3	42(43.3)	55(56.7)		
4-6	4(36.4)	7(63.6)		
7+	0(0.0)	1(100.0)		

Source: Primary Data, 2024

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The Chi-square test in Table 5 revealed that gender (χ^2=5.074, p=0.024), educational level (χ^2=10.653, p=0.014) and EMR work experience (χ^2=4.620, p=0.042) had significant association with the EMR adoption among healthcare providers in Kirehe District Health Facilities.

Individual Factors Associated with Adoption of EMR System Use

Table 6: Individual Factors Associated with Adoption of EMR System Use

Variables	Adoption of EMR system use (N=136)		Pearson Chi-Square (χ^2)	P-Value
	Adopted (N=52) N(%)	Not adopted (N=84) N(%)		
EMR preference vs. Paper record			9.382	**0.002**
Yes	51(43.2)	67(56.8)		
No	1(5.6)	17(94.4)		
Beliefs about quality of care improvement while using EMR			3.927	0.140
Significant	45(42.1)	62(57.9)		
Only little	7(26.9)	19(73.1)		
No quality	0(0.0)	3(100.0)		
Perception on quick data driven decision-making			15.483	**0.001**
Strongly agree	36(52.9)	32(47.1)		
Agree	12(24.0)	38 (76.0)		
Neutral	4(40.0)	6(60.0)		
Disagree	0(0.0)	8(100.0)		
Strongly disagree	0(0.0)	0(0.0)		
Perception on reduction of medical recording errors			11.118	**0.011**
Strongly agree	25(55.6)	20(44.4)		
Agree	25(33.3)	50(66.7)		
Neutral	2(14.3)	12(85.7)		
Disagree	0(0.0)	2(100.0)		
Strongly disagree	0(0.0)	0(0.0)		
Perception on reporting facilitation (generation of reports)			5.623	**0.031**
Strongly agree	28(38.4)	45(61.6)		
Agree	13(38.2)	21(61.8)		
Neutral	11(50.0)	11(50.0)		
Disagree	0(0.0)	7(100.0)		
Strongly disagree	0(0.0)	0(0.0)		
Perception on Perception on generated reports accuracy			3.797	0.284
Strongly agree	33(42.3)	45(57.7)		
Agree	13(35.1)	24(64.9)		
Neutral	6(37.5)	10(62.5)		
Disagree	0(0.0)	5(100.0)		
Strongly disagree	0(0.0)	0(0.0)		
Perception on time saving while using EMR			**7**.582	0.108
Strongly agree	36(40.4)	53(57.7)		
Agree	16(44.4)	20(64.9)		
Neutral	0(0.0)	2(100.0)		
Disagree	0(0.0)	8(100.0)		
Strongly disagree	0(0.0)	1(100.0)		
Perception on impact of EMR use on care provision			1.589	0.452
Positive	51(39.2)	79(60.8)		
Negative	1(25.0)	3(75.0)		
None	0(0.0)	2(100.0)		
Limited knowledge of using computer			0.747	0.862
Strongly agree	17(41.5)	24(58.5)		
Agree	23(34.8)	43(65.2)		
Neutral	5(45.5)	6(54.5)		
Disagree	7(38.9)	11(61.1)		
Strongly disagree	0(0.0)	0(0.0)		

Source: Primary Data, 2024

The Chi-square test in Table 6 revealed that EMR preference (χ^2=9.382, p=0.002), quick data-driven decision-making (χ^2=15.483, p=0.001), reduction of medical recording errors

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(χ^2=11.118, p=0.011) and reporting facilitation (χ^2=5.623, p=0.031) had significant association with the EMR adoption among clinicians in Kirehe District Health Facilities.

Technological Factors Associated with Adoption of EMR System Use

Table 7: Technological Factors Associated with Adoption of EMR System Use

Variables	Adoption of EMR system use (N=136)		Pearson Chi-Square (χ^2)	P-Value
	Adopted (N=52) N(%)	Not adopted (N=84) N(%)		
Lack of IT skills provision/capacity building			2.213	0.529
Strongly agree	18(38.3)	29(61.7)		
Agree	25(43.9)	32(56.1)		
Neutral	4(30.8)	9(69.2)		
Disagree	5(26.3)	14(73.7)		
Strongly disagree	0(0.0)	0(0.0)		
Electrical power issues			8.983	0.062
Strongly agree	9(32.1)	19(67.9)		
Agree	24(42.1)	33(57.9)		
Neutral	3(17.6)	14(82.4)		
Disagree	15(55.6)	12(44.4)		
Strongly disagree	1(14.3)	6(85.7)		
Problem of internet connection & speed			5.181	0.269
Strongly agree	12(26.7)	33(73.3)		
Agree	19(38.8)	30(61.2)		
Neutral	8(50.0)	8(50.0)		
Disagree	7(53.8)	6(46.2)		
Strongly disagree	6(46.2)	7(53.8)		
Daily Electronic Medical Record use in care provision			2.188	0.139
Yes	47(40.9)	68(59.1)		
No	5(23.8)	16(76.2)		
Use of computer in other HF works other than EMR			4.305	**0.038**
Yes	51(40.8)	74(59.2)		
No	1(9.1)	10(90.9)		
Frequency internet lost during daily work			4.153	0.125
Never	3(23.1)	10(76.9)		
Often	44(43.1)	58(56.9)		
Always	5(23.8)	16(76.2)		
Quality of internet in the health facility			13.339	**0.001**
Good	35(53.8)	30(46.2)		
Poor	11(27.5)	29(72.5)		
Unreliable	6(19.4)	25(80.6)		
Internet service provider at HF			7.840	**0.049**
MTN	45(44.1)	57(55.9)		
Airtel-Tigo	0(0.0)	7(100.0)		
Mango/4G lite	1(16.7)	5(83.3)		
Not sure	6(28.6)	15(71.4)		

Source: Primary Data, 2024

The Chi-square test in Table 7 revealed that use of computer in other HF work (χ^2=4.305, p=0.038), quality of internet (χ^2=13.339, p=0.001) and internet service provider (χ^2=7.840, p=0.049 had significant association with the EMR adoption among clinicians in Kirehe District Health Facilities.

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Health Facility Factors Associated with Adoption of EMR System Use

Table 8: Health Facility Factors Associated with Adoption of EMR System Use

Variables	Adoption of EMR system use (N=136)		Pearson Chi-Square (χ^2)	P-Value
	Adopted (N=52) N (%)	Not adopted (N=84) N (%)		
Number of staff to accommodate EMR use			19.792	**<0.001**
Enough	11(100.0)	0(0.0)		
Few	39(33.6)	77(66.4)		
Not sure	2(22.2)	7(77.8)		
Insufficient computers and other IT equipment			3.820	0.431
Strongly agree	9(25.0)	27(75.0)		
Agree	24(42.9)	32(57.1)		
Neutral	3(37.5)	5(62.5)		
Disagree	9(42.9)	12(57.1)		
Strongly disagree	7(46.7)	8(53.3)		

Source: Primary Data, 2024

The Chi-square test in Table 4.7 revealed that the number of staff to accommodate EMR use (χ^2=19.792, p<0.001) had significant association with the EMR adoption among clinicians in Kirehe District Health Facilities.

Multivariate Analysis

This section describes the strength of relationship between factors associated with socio-demographic, individual, technological and health facility related factors and EMR adoption among clinicians in Kirehe District Health Facilities. Factors analyzed in this section were only those that were found to show associations with EMR adoption based on chi-square results. These factors include gender (χ^2=5.074, p=0.024), educational level (χ^2=10.653, p=0.014), EMR work experience (χ^2=4.620, p=0.042), EMR preference (χ^2=9.382, p=0.002), quick data-driven decision-making (χ^2=15.483, p=0.001), reduction of medical recording errors (χ^2=11.118, p=0.011) and reporting facilitation (χ^2=5.623, p=0.031), use of computer in other HF work (χ^2=4.305, p=0.038), quality of internet (χ^2=13.339, p=0.001), internet service provider (χ^2=7.840, p=0.049 and number of staff to accommodate EMR use (χ^2=19.792, p<0.001).

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Table 1: Multivariate Analysis of Factors Associated with Adoption of EMR System

Variables	Adjusted Odds Ratio (AOR)	95% CI		p-value
		Lower	Upper	
Perception on reporting facilitation (generation of reports)				
Strongly agree	3.14	1.128	6.023	<0.001
Agree	0.87	0.214	0.998	0.684
Neutral	0.16	0.074	0.865	0.783
Disagree	0.45	0.132	0.784	0.928
Strongly disagree	Reference			
EMR use experience [years]				
7+	1.18	1.203	3.908	0.107
4-6	1.21	1.007	3.230	0.069
1-3	4.23	1.309	8.003	0.021
Below 1	Reference			
Quick data-driven decision-making				
Strongly agree	5.61	1.829	11.864	0.022
Agree	0.98	0.119	1.774	0.572
Neutral	0.54	0.047	0.998	0.387
Disagree	0.39	0.017	0.687	0.829
Strongly disagree	Reference			
Quality of internet				
Good	4.29	1.005	7.879	0.002
Poor	2.16	1.019	4.023	0.069
Unreliable	Reference			

Source: Primary Data, 2024

The Table 8 showed that perception on reporting facilitation (easy generation of reports), EMR work use experience, data-driven decision-making and quality of internet were significantly associated with EMR system adoption among clinicians in Kirehe District Health Facilities. Clinicians who strongly agreed that EMR system eases reports generation were more likely to adopt the EMR system use (AOR=3.14, 95%CI: 1.128–6.023, p<0.001) compared to those who strongly disagreed. Users who have used EMR system between 1 to 3 years were more likely to adopt EMR system use (AOR=4.23, 95% CI: 1.309–8.003, p=0.021) compared to those who have used the system for a period of less than 1 year. Clinicians who strongly agreed that EMR system supports in quick data-driven decision-making to improve patient's care were more likely to adopt the EMR system use (AOR=5.61, 95%CI: 1.829–11.864, p=0.022) compared to those who strongly disagreed. Clinicians who said that the quality of internet at the health facility was good during working hours were more likely to adopt EMR system use (AOR: 4.29, 95%CI: 1.005-7.879, p=0.002) compared to those who reported that the internet was unreliable.

CONCLUSION AND RECOMMENDATIONS

Summary

Socio-demographic Characteristics of Participants

Most of participants (41.2%) were aged between 25-35 years. The mean age was 34.6 years. Most of participants were male (50.7%). A lot of them were married (74.3%). Most of participants were nurses (46.3%). Most of them had bachelor degree (44.9%). Most of participants had ≤ 5 years of working experience (44.1%). A big number of participants had between 1-3 years of EMR working experience (71.3%). The study findings in Table 4.2

showed that 25.8% of study participants had low, 36.0% had moderate while 38.2% had high levels of EMR use in Kirehe District Health Facilities.

Level of Use of EMR System in Kirehe District Health Facilities

The study findings showed that 25.8% of study participants had low, 36.0% had moderate while 38.2% had high levels of EMR use in Kirehe District Health Facilities. The percentage of adoption of EMR system at health facility was 38.2.

Perceptions of Healthcare Providers towards the Provision of Medical Care using EMR in Kirehe District Health Facilities

Findings revealed that most of the study participants (86.8%) said they prefer using EMR rather than paper-based medical records. A big number (78.7%) of study participants believed that the quality of care is improved when using EMR. A lot of study participants (50.0%) strongly agreed that decisions about patient care are quickly taken based on electronic data. During the record of patient's data, most of the study participants (55.1%) agreed that errors are reduced while using EMR system. A big number of study participants (53.7%) strongly agreed that EMR system makes easy the generation of reports as it is automated and strongly agreed (57.4%) that the reports from the EMR system are accurate. Most of study participants (65.4%) strongly agreed that recording patient's data using EMR system saves time. A lot of study participants (95.6%) said that EMR use has a positive impact on patient care provision.

Factors Associated with Adoption of EMR System among Healthcare Providers in Kirehe District Health Facilities

Perception on reporting facilitation (easy generation of reports), EMR work use experience, data-driven decision-making and quality of internet were significantly associated with EMR system adoption among healthcare providers in Kirehe District Health Facilities. Healthcare providers who strongly agreed that EMR system eases reports generation were more likely to adopt the EMR system use (AOR=3.14, 95%CI: 1.128–6.023, p<0.001) compared to those who strongly disagreed. Clinicians who have used EMR system between 1 to 3 years were more likely to adopt EMR system use (AOR=4.23, 95% CI: 1.309–8.003, p=0.021) compared to those who have used the system for a period of less than 1 year. Healthcare providers who strongly agreed that EMR system supports in quick data-driven decision-making to improve patient's care were more likely to adopt the EMR system use (AOR=5.61, 95%CI: 1.829–11.864, p=0.022) compared to those who strongly disagreed. Healthcare providers who said that the quality of internet at the health facility was good during working hours were more likely to adopt EMR system use (AOR: 4.29, 95%CI: 1.005-7.879, p=0.002) compared to those who reported that the internet was unreliable.

Conclusion

The percentage of adoption of EMR system among clinicians in Kirehe District Health Facilities is still low; this requires more trainings of new clinicians and refresher trainings for existing staff on the system. Perception on reporting facilitation (easy generation of reports), EMR work use experience, data-driven decision-making and quality of internet were significantly associated with EMR system adoption among healthcare providers in Kirehe District Health Facilities.

Recommendations

The recommendations are addressed to Rwanda Ministry of Health, Rwanda Biomedical Center, Kirehe District Hospital and Health Centers in the catchment area.

Recommendations to Ministry of Health and Rwanda Biomedical Centre

They are recommended to provide strong internet to all health facilities in Kirehe District.

Recommendations to Kirehe District Hospital

Recommendations to Kirehe District Hospital that supervises health centers in the district are: Train new healthcare providers who join the health facilities and plan regular refresher trainings for long serving staff, regularly Mentor and supervise regularly the 17 Health Centers to enhance the EMR system use, advocate for internet stability at health facilities & collaborate with its partners to stabilize internet at health facilities.

Recommendations to Health Centers in Catchment Area of Kirehe District Hospital

The following are recommendations to health centers in Kirehe District: Conduct on-job training between healthcare providers in each health center, generate reports from EMR system rather than struggling with paper-based records & use the system to improve patients' care.

Suggestions for further study

The following suggestions are targeting further researchers in the same area: Conduct the same study in the whole country to have the national picture, benefits and challenges of implementing the electronic medical record system, knowledge, attitude and practices of EMR system among healthcare providers in Rwanda & barriers to the adoption of EMR system in Rwanda.

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