Utilization of Electronic Medical Record System for the Management of HIV/AIDS Information in Public Hospitals in Homa Bay County, Kenya

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Abstract

The adoption of Electronic Medical Records (EMR) is increasing globally due to its potential to improve data accuracy and patient management. However, in Kenya's public health sector, especially in Homa Bay County, full EMR utilization remains limited, hindered by reliance on paper systems and frequent data loss. This study aimed to identify key socio-demographic, organizational, human, and technological factors influencing EMR use for managing HIV/AIDS information in public hospitals in Homa Bay County. Using a cross-sectional design, 198 healthcare professionals were selected via stratified random sampling. Data were collected through structured and unstructured questionnaires and analyzed using STATA version 18 and thematic analysis. Chi-square tests revealed that education level ($p < .001$) and staff cadre ($p < .001$) significantly influenced EMR use, with diploma holders and clinical staff showing higher odds of full utilization. Human factors, including continuous use (OR = 5.75, $p = .005$), frequency, perceived usefulness, and provider demand, were significant predictors. Organizational factors identified capacity building and support (OR = 3.35, $p = .026$) as the only significant influence. Technological factors, including user-friendliness, access speed, internet bandwidth, and system orientation, showed strong associations with full utilization ($p < .05$), while age, gender, and other structural variables were not significant. Findings highlight the critical roles of training, usability, and support systems in promoting EMR adoption in public healthcare. The study concludes that targeted capacity-building for support and data staff, addressing technological barriers through system upgrades, fostering positive attitudes via mentorship and supervision, and enforcing organizational policies and governance are essential to sustain meaningful EMR use. The study recommends targeted capacity-building for support and data staff, addressing technological barriers through system upgrades, fostering positive attitudes via mentorship and supervision, and enforcing organizational policies and governance to sustain meaningful EMR use.

Keywords: *Electronic Medical Records, EMR Utilization, Human Determinants, Organizational Factors, Technological Factors, HIV/AIDS Information Management*

1.0 Background to the Study

The integration of Information Technology (IT) into Health Information Management Systems (HIMS) has gained global recognition for its potential to enhance healthcare service delivery and is increasingly being adopted by healthcare facilities worldwide (Pollak & Lorch, 2007). The healthcare sector continues to embrace innovative IT solutions to strengthen clinical management and improve healthcare outcomes (Barlow, 2017). Among these innovations, the Electronic Medical Record (EMR) system stands out as a key tool for improving healthcare quality, increasing efficiency, supporting clinical research, streamlining processes, optimizing performance, and reducing human errors (Cowie et al., 2017; Kruse et al., 2018). Despite these benefits, EMR adoption has been relatively slow compared to other sectors, a trend attributed to resistance from healthcare professionals and other implementation challenges (Hillestad et al., 2005; Rudin et al., 2016; Safi et al., 2018). To address these challenges and accelerate IT uptake in healthcare, a thorough root cause analysis is necessary (Barlow, 2017). Several empirical studies suggest that both organizational and individual factors significantly influence the slow pace of IT adoption in healthcare (De Benedictis et al., 2020; Oliveira & Martins, 2011). However, there remains ambiguity regarding which factors exert greater influence. Some scholars argue that organizational factors play a dominant role by shaping employee behavior through policies and institutional regulations (Gastaldi et al., 2019). In contrast, other studies emphasize the impact of individual characteristics such as demographic factors, user attitudes, and technological considerations on IT uptake and acceptability (De Benedictis et al., 2020). Despite these insights, the extent to which these factors affect EMR utilization remains inadequately explored, particularly in resource-limited settings.

Globally, disparities in healthcare IT adoption between high-income and low- to middle-income countries persist, particularly in EMR utilization for patient information management. For instance, developed countries such as the United States have achieved high EMR adoption rates due to supportive policies and incentives, whereas developing nations like Kenya continue to face challenges such as inadequate resources, weak data collection systems, lack of accountability in information management, and insufficiently trained personnel (Sherer et al., 2016). In response, the Kenyan government initiated EMR adoption between 2012 and 2014, particularly through the National AIDS and STI Control Programme (NASCOP) to enhance HIV/AIDS management. With support from the International Training and Education Center for Health (ITECH), approximately 350 healthcare facilities were equipped with the Kenya Electronic Medical Records (KenyaEMR) system (Muthee et al., 2018). These facilities, spread across different regions including Homa Bay, experienced notable benefits such as improved patient services, better record-keeping, easier follow-ups, and enhanced stock management (Muinga et al., 2018).

Despite these achievements, significant challenges hindered full EMR utilization in Kenya. Key issues included lack of interoperability between different EMR platforms such as OpenMRS, AMPATH, IQCare, and the Comprehensive Patient Application Database (C-PAD), as well as limited direct use by clinicians, with data clerks primarily conducting retrospective rather than real-time data entry (Muinga et al., 2018). Consequently, facilities continued to experience loss of patient information, delays in treatment, and reliance on paper-based systems despite the availability of EMR. These challenges highlight the need to examine why EMR use remains below expectations in public health facilities. This study, therefore, sought to investigate the utilization of EMR systems

for managing HIV/AIDS information in public hospitals in Homa Bay County, Kenya, and to explore the socio-demographic, organizational, human, and technological factors influencing their adoption.

1.1 Problem Statement

The consistent growth of EMR in Kenya's healthcare sector, particularly in Homabay County, can be attributed to its open-source nature, offering cost-effective alternatives to licensed software (Muinga et al., 2018). EMR adoption has led to enhanced healthcare efficiency, reduced medical practitioner workload, and prevention of errors (Graber et al., 2017). Despite these benefits, the failure rate of EMR implementation in the health sector, estimated at 50% to 80%, is a concern when not properly tested (Abdekhoda et al., 2019; Mwang'ombe et al., 2019). A huge factor that has hindered the full adoption of EMR in most of the Level Four Hospitals in Kenya is the limited ICT knowledge possessed by the staff in these hospitals; this is most notable, particularly in patients who manage HIV/AIDS patients (Mwang'ombe et al., 2019). Manual data collection and review have resulted in prolonged patient wait times. Long waiting times can compromise care quality, as highlighted by previous research. Efforts between the Kenyan government and development actors have aimed to facilitate smooth EMR implementation, yet dissatisfaction among staff in public hospitals remains (Muthee et al., 2018).

While studies have explored EMR determinants in urban facilities, the situation in rural settings like Homabay County's level 4 sub-county hospitals is less examined (Muthee et al., 2018). As per the NASCOP Kenya EMR website, despite Homabay having EMR in all 165 health facilities, only a 67% data update rate was achieved compared to paper-based records. This underutilization can undermine decision-making and lead to financial losses (Odekunle et al., 2017). This study focused on understanding the reasons for sub-optimal EMR utilization and aimed to identify factors hindering full EMR utilization at Homa Bay County's Level 4 public hospitals. These factors included staff ICT knowledge, software reliability, and unique rural healthcare challenges. The study employed surveys and in-depth interviews to shed light on these issues and contribute to improving EMR implementation and patient care quality.

1.2 Research Objectives

i. To examine how socio-demographic factors influence the extent to which Electronic Medical Record (EMR) systems are utilized for managing HIV/AIDS information in public hospitals within Homa Bay County, Kenya.

ii. To assess the role of human-related factors in shaping the level of use of Electronic Medical Record systems in the management of HIV/AIDS data in public health facilities in Homa Bay County.

iii. To explore organizational-level factors affecting the adoption and use of Electronic Medical Record systems for HIV/AIDS information management in public hospitals across Homa Bay County.

iv. To evaluate how technological factors impact the degree of utilization of Electronic Medical Record systems in the handling of HIV/AIDS information in Homa Bay County's public hospitals.

1.3 Significance of the Study

EMR is thus an important factor as far as healthcare delivery is concerned as they do improve the efficiency of data collection, processing, and use by the health stakeholders including, the healthcare facilities managers, the healthcare providers, patients, development partners, donors, and the local government especially the county government and the national government as well as the scholars alike. The study objective is to investigate the height at which EMR is utilized, and elements guiding its implementation will be key in trying to provide some blueprints for adoption, especially in the service provision of level 4 hospitals in rural settings. The health care providers and health records professionals are the primary targets of the study since they are the custodians of EMR in their daily routine work. The study of enablers of EMR and gaps will go a long way in helping toward patient-centered service provision. Donors and implementing partners will benefit from this study on what is the prerequisites for successful implementation of the EMR in the facility that they support. Overall, the results of this undertaking will complement those of other relevant scholars to help formulate policies at the two government levels. lastly, these findings will help in helping with the identification and formulation of the theoretical framework and an empirical framework for other interested scholars in the HMIS domain.

2.0 Literature Review

The World Health Organization (WHO) published a manual in 2006 to guide less-developed countries on EMR readiness, emphasizing the need for customized approaches based on each country's context. The manual highlighted critical elements for successful implementation, including clinical processes, infrastructure, human capital, training, and compliance with standards (WHO, 2006). In Kenya, the Ministry of Health (MOH), through the Division of Health Information Systems, envisioned EMR systems that enhance comprehensive healthcare delivery, improve patient record management, and uphold confidentiality, reliability, and data security through robust access control measures (MOH, 2010). According to the Kenya MOH (2010), EMR systems should facilitate knowledge exchange among various hospital users, including clinicians, nurses, pharmacists, and patients. Effective EMR systems are expected to meet six essential functions: capturing clinical and demographic data, providing clinical decision support, enabling prescription ordering, generating health reports, ensuring patient data security, and promoting information sharing among authorized users (Herbst et al., 2015).

Patient consent remains crucial, with explicit disclosure of data usage, storage, and expiration to safeguard confidentiality (Safi et al., 2018). Successful EMR implementation relies on clinician engagement during design, comprehensive user training, and system usability (Janssen et al., 2021). Critical enablers include adequate IT infrastructure, reliable bandwidth, and technical support (Ngugi et al., 2021). In Kenya, programs like I-TECH have supported EMR adoption in over 300 facilities, demonstrating progress in digital health integration. However, system features must remain user-friendly to enable efficient data entry, retrieval, and updates (Ngugi et al., 2021). Information and Communication Technology (ICT) integration has transformed healthcare operations, improving administrative functions, procurement, and emergency response (Isemeck et al., 2019). ICT facilitates EMR-driven efficiency but faces barriers such as inadequate bandwidth, cybersecurity concerns, and low digital literacy among healthcare staff (Mwang'ombe et al., 2019). Sustainable EMR implementation requires dependable infrastructure, reliable power, data backups, and collaborative efforts between IT and healthcare teams (Bisrat et al., 2021). Kenya's eHealth

Strategy (2016) showcased ICT's role in health information systems, telemedicine, and capacity-building.

Compared to paper records, EMRs offer numerous benefits, including improved patient safety, faster healthcare processes, and enhanced communication among providers (Kumari & Chander, 2024). EMRs enable seamless information sharing, real-time updates, and secure transmission of patient data (Ariffin et al., 2018). Additional benefits include better clinical decision-making, reduced prescription errors, improved patient tracking, and higher accountability among clinicians (Ngugi et al., 2021; Marete, 2018). Moreover, EMRs facilitate research by enhancing data completeness and accessibility. EMR systems streamline processes such as online booking, reducing waiting times and supporting continuity of care (Wali et al., 2020; Nayak & Bhushan, 2021). They also lower operational costs by minimizing paper use, administrative expenses, and storage costs while enhancing overall efficiency (Munyaka et al., 2024). These cost-saving advantages are complemented by improved transparency and accountability in financial transactions and treatment documentation.

Despite the benefits, EMR implementation faces significant barriers, including inadequate computer literacy, limited funding for training, and infrastructural gaps (Mahal Alrehaili & Alsharqi, 2021). Developing countries like Kenya struggle with social barriers, lack of interoperability, cultural resistance, and insufficient policy support (Dutta & Hwang, 2020). To address these challenges, innovations such as localized system customization and robust governance frameworks are recommended (Ariffin et al., 2018). Kenya's health facilities, ranging from national referral hospitals to dispensaries, play a critical role in EMR adoption. However, challenges such as inadequate security, poor infrastructure, and lack of basic amenities hinder implementation (Muinga et al., 2018). Collaboration between healthcare facilities, ICT stakeholders, and government bodies is essential to address infrastructure and training gaps (Isemeck et al., 2019). Additionally, human factors, including provider attitudes, communication skills, technical competence, and commitment to professional development, remain vital for the success of EMR systems (Kruse et al., 2018).

3.0 Research Methodology

The study adopted a cross-sectional research design utilizing a mixed-method approach to integrate both qualitative and quantitative data for comprehensive analysis. Quantitative data were collected using structured questionnaires administered to healthcare workers selected through stratified random sampling across four Level 4 public hospitals in Homa Bay County, Kenya. These facilities were chosen based on their high HIV/AIDS patient workload. The sample size of 200 respondents was determined using Nassiuma's formula, ensuring proportional representation across the different professional cadres. In addition to the questionnaires, qualitative data were collected through in-depth interviews with key informants, including EMR implementing partners and Comprehensive Care Center (CCC) managers. The instruments were pre-tested in a similar facility to ensure validity and reliability, with the final questionnaire achieving a high internal consistency (KR-20 = 0.8729). Data collection followed ethical guidelines, with approvals obtained from relevant authorities, including Kenyatta University Ethical Review Board, NACOSTI, and county health offices. Informed consent was obtained from all participants, and confidentiality was maintained throughout the study. Quantitative data were analyzed using STATA 18, employing descriptive and inferential statistics such as chi-square tests and logistic regression to assess relationships between variables. Qualitative data underwent thematic analysis to identify emerging patterns.

4.0 Findings

The study findings were systematically presented in sections

4.1 Level of Utilization of EMR in Homabay County

An analysis of EMR system utilization levels among healthcare providers in Homa Bay County revealed that a majority of respondents (52%) reported full usage of the EMR system. A slightly smaller proportion (48%) indicated partial usage, while none of the respondents (0%) reported that the system was not used at all. This result was supported by In-depth Interviews conducted in four health facilities, where the participants highlighted several key benefits associated with EMR utilization. All four participants agreed that EMR significantly enhances the efficiency of patient care through real-time access to medical records. This is illustrated in figure 1.

Figure 1: Level of EMR Utilization in Homabay County

4.2 Socio-demographic factors and EMRs utilization the Management of HIV/AIDS Information

The first study objective was to investigate the sociodemographic determinants of the utilization level of an EMRs in the management of HIV/AIDS information. The analysis revealed a statistically significant association between education level and EMR utilization, $\chi^2(2) = 20.94$, $p < .001$. Cadre was also significantly associated with EMR utilization, $\chi^2(1) = 26.92$, $p < .001$. Other variables such as department, age, gender, and experience did not show statistically significant associations with EMR utilization. For example, departmental affiliation (service delivery vs. support services) yielded $\chi^2(1) = 0.56$, $p = .45$, and gender differences showed no significant disparity in EMR use, $\chi^2(1) = 0.32$, $p = .57$. This is summarized in table 1.

Table 1: Socio-demographic factors and EMR utilization

Variable	Category	Partial EMR Utilization (N)	Partial EMR Utilization (%)	Full EMR Utilization (N)	Full EMR Utilization (%)	Chi-square	df	p-value
Education Level	Certificate	41	78.9	11	21.1	20.94	2	0.001
	Diploma	54	41.5	76	58.5			
	Higher Education	7	46.7	8	53.3			
Age	Below 36 years	84	49.4	86	50.6	2.13	1	.144
	36+ years	18	66.7	9	33.3			
Gender	Male	40	48.2	43	51.8	0.32	1	.571
	Female	62	53.9	53	46.1			
Cadre	Clinical Staff	30	32.3	63	67.7	26.92	2	<.001
	Counseling/Support Staff	54	75	18	25			
	Data/Records Staff	18	56.3	14	43.4			
Experience (years)	0–5 years	12	60.0	8	40.0	0.63	2	.728
	5–10 years	35	50.0	35	50.0			
	10 + years	55	51.4	52	48.6			
Department	Service delivery	76	50.0	76	50.0	0.56	1	.455
	Support services	26	57.8	19	42.2			

4.3 Human factors and EMRs utilization the Management of HIV/AIDS Information

The second study objective was to investigate human determinants on the utilization level of EMRs for the management of HIV/AIDS information. A binomial logistic regression was performed. Before analysis, two variables, "Health professional's attitudes" and "Understanding and appreciating my role," were omitted from the model because they exhibited no variation in responses and thus provided no discriminatory power in the analysis (i.e., each variable had only one level). The overall model was statistically significant, $\chi^2(4) = 21.23$, $p < .001$, indicating a reliable distinction between full and partial users of EMR. The model explained 24% of the variance in EMR utilization (Nagelkerke R^2) and correctly classified 74.2% of cases.

Four predictors were statistically significant: Continuous usage of EMR emerged as the strongest predictor ($B = 1.75$, $SE = 0.62$, $z = 2.82$, $p = .005$), with users demonstrating continuous EMR usage being 5.75 times more likely to achieve full EMR utilization compared to partial utilization (OR = 5.75, 95% CI [1.71, 19.32]). Frequent use of EMR was also a significant predictor ($B = 1.52$, $SE = 0.58$, $z = 2.62$, $p = .009$), indicating that frequent EMR users were 4.58 times more likely to demonstrate full EMR utilization rather than partial utilization (OR = 4.58, 95% CI [1.46, 14.35]).

Similarly, the perceived usefulness of EMR significantly predicted full utilization (B = 1.38, SE = 0.54, z = 2.56, p = .011), with those who found EMR useful being 3.97 times more likely to achieve full EMR utilization (OR = 3.97, 95% CI [1.37, 11.51]). Healthcare providers' demand for patient information also emerged as a significant predictor (B = 1.41, SE = 0.59, z = 2.39, p = .017), with participants experiencing such demands being 4.10 times more likely to demonstrate full EMR utilization compared to partial utilization (OR = 4.10, 95% CI [1.29, 13.05]). In contrast, two variables did not significantly distinguish between full and partial EMR utilization. Decisions based on evidence from EMR showed no significant association with utilization level (B = 0.15, SE = 0.47, z = 0.32, p = .750), yielding an odds ratio of 1.16 (95% CI [0.46, 2.91]). Similarly, routine health information (Verification of data) systems were not significantly associated with EMR utilization level (B = 0.20, SE = 0.52, z = 0.38, p = .706), with an odds ratio of 1.22 (95% CI [0.44, 3.38]). This is summarized in table 2.

Table 2: Human factors and EMR utilization

Variable	Partial EMR Utilization (%)	Full EMR Utilization (%)	B	SE	z	p-value	OR [95% CI]
(Intercept)	–	–	-0.04	0.15	-0.29	0.771	0.96 [0.71, 1.30]
Healthcare providers' demand for patient information influences the level of EMR Utilization for the Management of HIV/AIDS Information in your facility	98.04%	98.95%	1.41	0.59	2.39	0.017	4.10 [1.29, 13.05]
	0.98%	1.05%	Ref	–	–	–	–
	0.98%	0%	Ref	–	–	–	–
The usefulness of EMR data for monitoring facility performance influences the level of EMR Utilization for the Management of HIV/AIDS Information in your facility	99.02%	100%	1.38	0.54	2.56	0.011	3.97 [1.37, 11.51]
	0.98%	0%	Ref	–	–	–	–
Health professionals' attitudes toward data collection influence the level of EMR Utilization for the Management of HIV/AIDS Information in your facility	100%	100%			N/A		
	0%	0%					
Routine health information systems(data verification) influence the level of EMR	99.02%	97.89%	0.2	0.52	0.38	0.706	1.22 [0.44, 3.38]

Utilization for the Management of HIV/AIDS Information in your facility	0%	1.05%	Ref	–	–	–	–
	0.98%	1.05%	Ref	–	–	–	–
Continuous usage of EMR in your workplace influences the level of EMR Utilization for the Management of HIV/AIDS Information in your facility	99.02%	100%	1.75	0.62	2.82	0.005	5.75 [1.71, 19.32]
	0.98%	0%	Ref	–	–	–	–
Understanding and appreciating my role and responsibilities regarding EMR influence the level of EMR Utilization for the Management of HIV/AIDS Information in your facility	100%	100%			N/A		
	0%	0%					
Frequent use of EMR for data collection has benefits for patients as well as health facilities, thus enhancing EMR Utilization for the Management Of HIV/AIDS Information in your facility	99.02%	100%	1.52	0.58	2.62	0.009	4.58 [1.46, 14.35]
	0.98%	0%	Ref	–	–	–	–
Decisions based on evidence from EMR have influenced the level of EMR Utilization for the Management of HIV/AIDS Information in your facility	99.02%	100%	0.15	0.47	0.32	0.75	1.16 [0.46, 2.91]
	0.98%	0%	Ref	–	–	–	–

The findings further showed that staff attitude significantly influences the utilization of EMR systems for managing HIV/AIDS information, with 93% of respondents affirming that positive attitudes foster consistent and effective use, while 7% noted that negative attitudes result in reluctance or inconsistent use. Additionally, the adoption of EMR systems has driven notable changes in work practices across healthcare facilities, with real-time access reported as the most significant improvement (98%), followed by enhanced efficiency and cost savings (76%), and clinical decision support (73%). Other benefits include improved patient engagement (64%), interoperability (57%), quality enhancement (52%), and centralized patient records (52%). However, moderate gains were observed in coordination (45%), data analytics (30%), and regulatory compliance (10%).

4.4 Organizational Factors and EMRs Utilization for the Management of HIV/AIDS Information

The third study objective was to investigate organizational determinants of the utilization level of EMRs for the management of HIV/AIDS information. A Binary logistic regression analysis was conducted, which shows analysis of EMR utilization across organizational factors revealed variations in usage levels associated with specific institutional characteristics. The model included six predictors: Access and Security Governance, Data Quality Standards, Institutional Incentives and Sanctions, Compulsory EMR Usage Policies, Capacity Building and Support Structures for EMR Adoption, and Effective Organizational Leadership in EMR Adoption. The full model was statistically significant, indicating that the predictors reliably distinguished between partial and full EMR utilization. The model chi-square was $\chi^2(6) = 10.71$, $p = .097$, with a residual deviance of 262.14 on 190 degrees of freedom and an AIC of 276.14. This suggests a reasonable model fit, although not a highly strong one.

Among these factors, only Capacity Building and Support Structures for EMR Adoption emerged as a statistically significant predictor of full EMR utilization, $B = 1.21$, $SE = 0.55$, $z = 2.22$, $p = .026$. The odds ratio (OR = 3.35, 95% CI [1.16, 9.66]) indicates that organizations with structured training and support mechanisms were over three times more likely to achieve full EMR utilization compared to those without such support, controlling for other variables. Other factors, including Compulsory EMR Usage Policies (OR = 1.25, $p = .721$), Access and Security Governance (OR = 2.17, $p = .173$), Institutional Incentives and Sanctions (OR = 1.04, $p = .958$), Data Quality Standards (OR = 1.16, $p = .682$), and Effective Organizational Leadership in EMR Adoption (OR = 1.92, $p = .626$), did not show statistically significant associations with full EMR utilization in this model. This is summarized in table 3

Table 3: Human factors and EMR utilization

Variables	Partially Utilized (N)	Partially Utilized (%)	Fully Utilized (N)	Fully Utilized (%)	B	SE B	z	p-value	OR	95% CI
(Intercept)	–	–	–	–	-1.96	1.41	-1.40	.163	0.14	[0.01, 1.60]
Access and Security Governance	8	33.33%	16	66.67%	0.77	0.57	1.36	.173	2.17	[0.69, 6.86]
Data Quality Standards	23	44.23%	29	55.77%	0.15	0.36	0.41	.682	1.16	[0.57, 2.36]
Institutional Incentives and Sanctions	3	33.33%	6	66.67%	0.04	0.82	0.05	.958	1.04	[0.20, 5.33]
Integration into Existing Organizational Workflows	49	46.23%	57	53.77%	–	–	–	–	–	–

Compulsory EMR Usage Policies	7	35.00%	13	65.00%	0.22	0.62	0.36	.721	1.25	[0.37, 4.23]
Capacity Building and Support Structures for EMR Adoption	86	48.86%	90	51.14%	1.21*	0.55	2.22	.026	3.35	[1.16, 9.66]
Effective Organizational Leadership in EMR Adoption	100	51.55%	94	48.45%	0.65	1.33	0.49	.626	1.92	[0.14, 25.80]

The findings further revealed high level of organizational support for data use in decision-making and service delivery, with 98% of respondents reporting such support. Similarly, the utilization of EMRs for operational and clinical decision-making was widespread, as 99% of respondents indicated regular use of EMRs for tasks such as tracking patient defaults, monitoring performance, and assessing data quality, while only 1% reported non-use. Furthermore, training opportunities emerged as a key indicator of organizational support for EMR adoption, with 97% of respondents receiving continuous training, 16% undergoing orientation for newly introduced systems, and 3% accessing specialized training such as role-specific, technical, or refresher courses.

4.5 Technological factors and EMRs utilization for the Management of HIV/AIDS Information

The final study objective was to investigate technological determinants in the utilization of EMRs for the management of HIV/AIDS information. A series of bivariate analyses was conducted to examine associations between technological factors and EMR utilization. Statistical significance was assessed using Fisher's Exact and Chi-square tests depending on the distribution of data. The study zeroed in on Internet bandwidth, security and privacy concerns, confidentiality, integrity, and communication as the technological factors and how they influence EMR utilization. Results revealed that EMR user-friendliness was significantly associated with full EMR utilization (Fisher's Exact Test, p = .013). Notably, 100% of respondents who found the system user-friendly reported at least partial use, with 48% achieving full utilization, compared to the single respondent who did not find the system user-friendly, who reported full utilization. EMR access speed also showed a significant relationship (p = .018), where all users with low access speed (n = 2) achieved full utilization, indicating that better access may play a role in usability and engagement. Similarly, internet bandwidth was significantly associated with EMR utilization ($\chi^2(1)$ = 5.69, p = .017). Higher bandwidth users had a higher proportion of full utilization (50%) compared to those with lower bandwidth (42.2%). This is summarized in table 4.

Table 4: Technological Factors and EMR Utilization

Technological Factor	Utilization Category	Partially Utilized (N)	Partially Utilized (%)	Fully Utilized (N)	Fully Utilized (%)	Test Statistic	Df	p-value
Tablets/Computers within the Department	< 5	79	51.30%	75	48.70%	χ^2	2	0.958
	5–10	11	52.38%	10	47.62%			
	> 10	12	54.55%	10	45.45%			
EMR Access Speed	High	102	52.31%	93	47.69%	Fisher's Exact Test		0.018
	Low	2	100%	0	0%			
Internet Bandwidth	High	76	50%	76	50%	χ^2	1	0.017
	Low	26	57.78%	19	42.22%			
EMR User-Friendliness	Yes	7	100%	0	0%	Fisher's Exact Test		0.013
	No	102	52.04%	94	47.96%			
Orientation on EMR	Yes	98	51.58%	92	48.42%	Fisher's Exact Test		0.034
	No	4	57.14%	3	42.86%			
EMR Confidentiality & Privacy	Yes	101	51.53%	95	48.47%	Fisher's Exact Test		1.000
	No	0	0%	1	100%			
EMR Security	Yes	101	51.53%	95	48.47%	Fisher's Exact Test		1.000
	No	0	0%	1	100%			

The qualitative data from in-depth interviews revealed that the availability of devices and reliable infrastructure are critical for effective EMR utilization. One of the participants emphasized that limited device availability, often due to budget constraints, hinders timely data entry, especially during peak hours when many providers need system access. Another participant highlighted that technological breakdowns, such as unreliable networks, disrupt patient flow and system operations. Despite 80% of survey respondents rating the speed of EMR data access as very high and 19% as high, qualitative findings demonstrated ongoing challenges, particularly network interruptions and power outages, which force providers to revert to manual entry and cause data backlogs. For example, one of the participants noted frequent system downtimes, while another cited recurrent depletion of internet bundles as a major barrier to timely data retrieval and service delivery. Finally, although 77% of respondents believed internet connectivity was consistently high during working hours, 22% reported it was only occasionally high, and 1% said it was never high, indicating that connectivity remains a significant concern affecting EMR system efficiency.

5.0 Discussion

This study found that 52% of healthcare providers in Homa Bay County reported full utilization of the Electronic Medical Record (EMR) system, while 48% indicated partial use. Notably, none of

the respondents reported complete non-use of the system. These findings indicate a moderate level of EMR integration within routine healthcare delivery within Homabay County. Comparable levels of EMR adoption have been documented across low- and middle-income countries (LMICs), revealing persistent gaps between availability and full utilization. For instance, Were et al. (2019) reported that 55% of healthcare workers in Uganda consistently used EMRs, with training and supervision serving as key enablers. Similarly, Oluoch et al. (2012) highlighted inconsistent usage in Kenyan facilities due to infrastructural limitations and variable user competence. The current study's near-equal distribution of full and partial users suggests foundational elements for EMR implementation exist, but barriers such as insufficient training, unreliable connectivity, and lack of role-specific design continue to hinder optimal adoption. Ibrahim et al. (2020) corroborated these findings by emphasizing the significance of technical support and system relevance to job roles in influencing EMR uptake.

The study identified education level and staff cadre as significant socio-demographic determinants of EMR utilization. Healthcare providers with higher academic qualifications demonstrated greater likelihood of full EMR use, consistent with Adeyeye et al. (2024) and Berhe et al. (2017), who linked education to improved digital literacy and technology openness. Clinical staff exhibited higher engagement compared to support or data staff, echoing Ngusie et al. (2022), who attributed this to direct patient-care responsibilities necessitating EMR use. Contrary to earlier findings (Senishaw et al., 2023), variables such as age, gender, and years of experience were not significant, suggesting that intrinsic demographic factors may have less influence than professional role and training exposure in shaping EMR usage. These findings imply that targeted interventions focusing on cadres with lower digital exposure, such as support staff, could bridge usage gaps. Tailored capacity-building programs, including role-specific training, are necessary to achieve uniform adoption across healthcare teams. Aligning with recommendations by Yehualashet et al. (2021), such efforts would mitigate disparities in digital health engagement and promote comprehensive utilization of EMRs across all care domains.

Human determinants emerged as strong predictors of EMR utilization, with continuous usage, frequent engagement, perceived usefulness, and demand for patient information significantly associated with full adoption. Continuous use was the strongest predictor (OR = 5.75, p = .005), consistent with the Technology Acceptance Model (Davis, 1989), which emphasizes sustained behavior as a function of perceived ease and utility. Frequent usage (OR = 4.58, p = .009) and positive perceptions of EMR usefulness (OR = 3.97, p = .011) also reinforced adoption likelihood, aligning with Jamal et al. (2009) and Adeyeye et al. (2024). Provider demand for patient information (OR = 4.10, p = .017) shows clinical necessity as a motivational factor. Interestingly, evidence-based decision-making and data verification were not significant predictors, revealing a potential gap between EMR interaction and advanced functionalities, as highlighted by Kruse et al. (2016).

Organizational-level predictors largely lacked statistical significance, except for capacity-building initiatives, which were associated with over threefold higher odds of full EMR use (OR = 3.35, p = .026). This finding corroborates Yilma et al. (2023) and Sennuga et al. (2023), who identified training and continuous technical support as key enablers in resource-limited settings. Conversely, governance structures, compulsory use policies, incentives, and leadership showed no significant effect, possibly due to inconsistent enforcement or administrative roles being less operationally influential. These results suggest that while structural measures are important, their impact is

contingent upon concurrent human resource development strategies. Technological factors, particularly user-friendliness (p = .013), access speed (p = .018), internet bandwidth (p = .017), and EMR orientation (p = .034), significantly influenced utilization levels. These findings resonate with Kruse et al. (2016) and Senishaw et al. (2023), who emphasized usability and connectivity as pivotal for sustained engagement in LMIC settings. In contrast, variables such as device availability and data security measures were not significant, suggesting that user experience and practical functionality outweigh policy-level considerations in shaping daily usage patterns.

6.0 Conclusion

The study concludes that while EMRs have gained substantial acceptance among healthcare providers in Homa Bay County, partial engagement remains prevalent. Full adoption is significantly influenced by educational attainment and professional cadre, where higher education and clinical roles demonstrate greater EMR utilization. In contrast, factors such as age, gender, and years of experience showed no meaningful association, underscoring the importance of role-specific training rather than demographic characteristics. These findings highlight the urgent need for strategic investments in capacity building, targeting lower-cadre staff and those with limited academic qualifications, to ensure equitable adoption and maximize the impact of EMR systems in improving healthcare delivery. The study further concludes that human, organizational, and technological factors emerged as critical drivers of EMR adoption. Perceived usefulness, frequent use, and demand for patient information were strongly associated with full utilization, consistent with the Technology Acceptance Model (TAM). Additionally, capacity-building initiatives, robust technical support, and user-centered system design, including improved usability, reliable internet connectivity, and comprehensive orientation, were identified as key enablers of EMR engagement. Conversely, infrastructural availability and policy frameworks alone were insufficient to guarantee full utilization, indicating that system effectiveness depends on enhancing user experience and providing continuous support.

7.0 Recommendations

Based on the study findings, several recommendations are proposed to enhance EMR utilization. First, health authorities and facility managers in Homa Bay County should develop targeted strategies to address barriers such as training, system accessibility, and role-based relevance to ensure full EMR utilization among all healthcare providers. Second, capacity-building programs should be tailored for healthcare workers with lower educational qualifications and non-clinical cadres, including data staff, with a focus on continuous professional development to close utilization gaps and promote equitable adoption. Third, training initiatives should go beyond promoting frequent EMR use by strengthening the link between EMR application, evidence-based decision-making, and data quality assurance, supported by design improvements that enhance these functionalities. Fourth, organizations must prioritize robust capacity-building and technical support mechanisms, including ongoing mentorship and training, as these human-centered approaches are critical for sustaining adoption and amplifying the impact of existing governance structures. Finally, user-centered technological improvements should be prioritized by optimizing system usability, ensuring reliable internet connectivity, and providing effective system orientation, as these practical measures are essential for maintaining engagement and maximizing the utility of EMRs in resource-limited settings.

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