

# User Perception of Centralized Electronic Medical Records for HIV Care and Treatment in Uasin Gishu County, Kenya

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## Abstract

This study examined healthcare workers' perceptions of centralized electronic medical records (EMR) for HIV care and treatment in Uasin Gishu County, Kenya. Human Immunodeficiency Virus (HIV) remains a significant public health challenge in Africa and Kenya whereby existing electronic medical records (EMRs) for HIV care majorly operate as standalone systems, leading to duplication, lack of interoperability, and inconsistent documentation or unrecorded diagnoses, limited adherence tracking, and unreliable patient data management. Limited research has explored user perceptions in implementing centralized EMRs in HIV care.

Despite the benefits of centralized EMRs, including improved patient data management, security, and continuity of care, challenges such as system fragmentation, technical limitations, and centralized electronic medical record coverage remain low and where it is implemented its limited to disease or program specific like HIV and NCDs due to resource limitation. This cross-sectional study gathered quantitative data from 384 healthcare workers across 21 health facilities, using structured questionnaires that assessed user perception on centralized electronic medical records implantation, how socio-demographic factors influencing EMR perceptions. Analysis was performed using STATA, employing descriptive statistics and logistic regression to understand the relationship between these factors and EMR perception.

The findings reveal that allied health workers had 1.84 times higher odds of unfavorable perceptions toward centralized EMRs (A.O.R = 1.891, 95% CI: 1.145–3.123,  $p = 0.013$ ). Additionally, age (A.O.R = 0.932, 95% CI: 0.87–0.999,  $p = 0.0045$ ) Results indicated a positive perception of centralized EMRs among healthcare workers, with 95% acknowledging improved data accuracy and 93% recognizing enhanced data security. Younger healthcare workers and those with prior ICT training reported significantly higher satisfaction, emphasizing the importance of digital literacy in EMR.

Centralized EMRs can greatly enhance HIV care in Kenya by improving data management and patient care continuity, as the country prepares for hospital wide roll out of a unified country wide electronic medical record the finding of this study is useful to shape its implementation especially on health providers perception especially on their effectiveness and the benefits of a successful implementation. EMRs hold immense potential for improving health care, their success depends on addressing key factors that are determinants of EMR user satisfaction, like social demographic of users while organizational culture plays a more secondary role, the need for sustained investment in EMR infrastructure and targeted training tailored to healthcare workers' digital skills is key.

## Introduction

HIV remains a major global public health challenge, with an estimated 39.9 million people living with the virus by the end of 2023, 65% of whom are in the WHO African Region (WHO, 2024). The United Nations Sustainable Development Goal (SDG) 3.3 aims to end AIDS by 2030 (WHO, 2022), necessitating robust health information systems for accurate and timely patient data management. High-income countries like the United States and the United Kingdom have successfully implemented digital health records,

improving healthcare delivery and disease management (Tierney et al., 2016; Williams & Boren, 2008). These efforts have influenced low- and middle-income countries, including Kenya, to transition from paper-based to electronic medical records (EMRs) (Muinga et al., 2020). In Kenya, over 1.6 million people are living with HIV (Kenya HIV Estimates Report, 2022), highlighting the importance of efficient patient monitoring and continuity of care. Centralized EMRs offer substantial benefits for managing chronic diseases like HIV, ensuring long-term data accuracy and effective follow-up.

Kenya initiated EMR implementation in 2012 with support from partners such as USAID, PEPFAR, and the CDC. Systems like OpenMRS, KenyaEMR, and IQCare were introduced to enhance HIV patient management and evidence-based decision-making (Muinga et al., 2020). In Uasin Gishu County, the AMPATH Medical Records System (AMRS) exemplifies a centralized EMR for HIV care, recording over one million patient encounters (AMPATH, 2022). The centralized EMRs enable seamless patient data sharing across facilities, reducing duplication and improving data security. Kenya's HIV care systems rely heavily on accurate longitudinal patient tracking, but the lack of interoperability between EMR platforms hampers continuity of care, introducing duplication, inconsistent documentation, and inefficient patient management (Mugo & Nzuki, 2014).

While centralized EMRs address these challenges through enhanced data accessibility, adherence monitoring, and clinical decision-making (Gillum, 2013), user adoption remains limited, with only 7% of healthcare practitioners actively utilizing EMRs due to inadequate system integration and support (Mugo & Nzuki, 2014). Healthcare workers also face difficulties retrieving patient records when clients transfer facilities, emphasizing the need to assess user perceptions of centralized EMRs (Muinga et al., 2020).

Globally, integrated EMRs have improved patient care and operational efficiency, particularly in high-income settings (Williams & Boren, 2008). In resource-limited environments like Kenya, infrastructure constraints hinder widespread adoption (Muinga et al., 2020). However, experiences from Rwanda and Ethiopia demonstrate that interlinked EMR systems enhance healthcare efficiency, underscoring the need for Kenya to strengthen its digital health strategies (Niyibizi et al., 2021). Understanding healthcare providers' perceptions is crucial to optimizing centralized EMR implementation, improving adoption, and ensuring effective patient management. Scaling up these systems requires evidence-based approaches and documentation of lessons learned.

## **Materials and Methods**

### **Study Design**

This study employed an analytical cross-sectional design to assess user perceptions of centralized electronic medical records (EMRs) for HIV care and treatment. The study focused solely on quantitative data collection to measure factors influencing users using centralized EMRs.

### **Study Area**

The study was conducted in Uasin Gishu County, Kenya, which consists of six sub-counties: Ainabkoi, Soy, Turbo, Moiben, Kesses, and Kapseret. The county has 240 health facilities, twenty-one facilities offering HIV care and equipped with centralized EMRs were selected for the study.

### **Study Population**

The study targeted 1,018 healthcare providers working in 21 health facilities that offer comprehensive HIV care and utilize centralized EMRs. These healthcare workers included medical officers, pharmacists, pharmacy technologists, laboratory technologists, health records officers, clinical officers, nurses, and peer educators.

### **Sample Size Determination**

A sample size of 384 healthcare workers was calculated using Fisher's formula with a 95% confidence level, assuming a 50% perception rate. This sample size provided robust representation across different healthcare worker roles.

### **Sampling Technique**

A probability proportional sampling approach was applied to allocate the sample across facilities, ensuring representation of all cadres of healthcare workers. A simple random sampling technique was then used to select respondents from each facility within each cadre, ensuring diverse perspectives.

### **Data Collection Methods**

Data was collected using structured self-administered questionnaires. The questionnaire was divided into four sections: socio-demographic characteristics and user perceptions. Three trained enumerators with experience in public health and EMRs facilitated the data collection process. A pre-test study involving 39 healthcare workers was conducted at Mosoriot Health Centre, Nandi County, to validate the questionnaire on clarity and reliability.

### Data Analysis

Data was cleaned and analyzed using Microsoft Excel and STATA version 16. Descriptive statistics (frequencies and percentages) were used to summarize categorical variables. Chi-square tests were conducted for bivariate analysis, while logistic regression was applied at the multivariate level to identify key determinants of user perception. A Shapiro-Wilk test was used to assess data normality, and hypothesis testing was set at a 0.05 significance level.

### Ethical Considerations

Ethical approval was obtained from the Kenyatta University Ethics Review Committee, and authorization sort from the National Commission for Science, Technology, and Innovation. Further approvals were sought from the Uasin Gishu County government and the respective health facility administrators.

Informed electronic consent was obtained from all participants, ensuring voluntary participation with the right to withdraw at any stage without consequences. Confidentiality was upheld by anonymizing responses and securing data. Upon study completion, results were shared with healthcare workers to promote knowledge dissemination and future improvements in EMR utilization.

### Results

This section of the findings covered socio-demographic characteristics of participants and results from each objective. The response rate was 99.9%, with 384 healthcare workers participating in the study across various healthcare facilities in Uasin Gishu County, Kenya.

#### Objective 1: Influence of Socio-Demographic Factors on User Perception

Most respondents were from Level 4 health facilities (42.9%) and county referral hospitals (37.5%), with (14.6%) working in Level 3 health centers and only (6.3%) worked at one national referral hospital, the participants' demographics revealed an even gender distribution (51.3% female and 48.7% male). The majority (63.5%) were married, a sizable portion held a diploma (56.5%), and others had completed a bachelor's degree (19.1%). Most respondents were between 25 and 35 years old, with an average age of 32.5 years. and allied health workers made up 58.8% of the respondents. On average, participants had eight years of total work experience, with six years dedicated to HIV care.

Table 4.1: Socio-demographics characteristics of study participants

Health facility	Freq.	Percent
Level 3- Health Centre	54	14.6
Level 4-Sub County Hospital	162	42.9
Level 5-County Referral Hospital	144	37.5
Level 6- National Referral Hospital	24	6.3
Total	384	100
Gender	Freq.	Percent
Female	197	51.3
Male	187	48.7
Total	384	100
Marital Status	Freq.	Percent
Divorced	10	2.6
Married	244	63.5
Single	124	32.3
Widowed	6	1.6
Total	384	100
Education level	Freq.	Percent
Bachelors	90	23.4
College- Diploma	259	67.4
Higher National Diploma	29	7.6
Masters	6	1.6
Total	384	100
Cadre categories	Freq.	Percent
Clinical staff	158	41.1
Allied worker	226	58.9

Total	384	100			
<b>Staff trained on EMR</b>	<b>Freq.</b>	<b>Percent</b>			
Clinical Staff Trained	120	31.2			
Clinical Staff not Trained	38	9.9			
Allied Staff Trained	66	17.2			
Allied Staff not Trained	160	41.7			
Total	384	100			
<b>Variable</b>	<b>Obs.</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Age	384	32.5	5.6	21	51
Years of service worked since employment	384	8	5.2	0	37
Years of service worked exclusively in HIV care and treatment	384	6	5.1	1	27

**Objective 2: Extent of User Perception of Centralized EMR**

**Table 4.2** below presents study participants' perception of centralized electronic medical records, overall, when asked on general perception on centralized EMR 52.3% expressed favorable perception towards centralized electronic medical records for HIV care and treatment however most health care workers complexity of the system and down times experience us being unfavorable. Most users (93%) agree that the EMR made it easy to correct mistakes. Most (95.1%) believed that the centralized EMR improved task splitting. Only (79.4%) of users agreed that centralization enhances attention to details.

However, healthcare workers overwhelmingly recognized the positive impact of Electronic Medical Records (EMRs) on HIV care. Majority of participants (97.7%) highlighted how EMRs improved the completeness and accuracy of data, ensuring reliable HIV care records. The majority (96.1%) agreed that EMRs made task distribution among staff more efficient, simplifying processes like retrieving patient records and reducing repetitive work.

EMRs also strengthened data security (93%) of respondents affirmed that the system safeguarded sensitive HIV patient data. Additionally, (92.2%) credited EMRs with enhancing data validation, which elevated the quality and reliability of patient records. The system's ability to improve the speed and convenience of data exchange was another standout feature, with (93.8%) agreeing it smoothed interdepartmental coordination and made sharing information within the facility faster. This efficiency was especially critical in HIV care, where timely access to information can directly influence treatment success.

Table 4.2: User perception of Centralized EMR among study participants

User perception factors	Disagree		Neutral		Agree		TOTAL
	N	(%)	N	(%)	N	(%)	
Using EMR made it easy to correct mistakes	9	2.3%	18	4.7%	357	93.0%	384
The use of centralized EMR improves the splitting of tasks	6	1.6%	13	3.4%	365	95.1%	384
Centralization of EMR improves healthcare workers' attention to details	53	13.8%	26	6.8%	305	79.4%	384
The use of EMR has improved the completeness of HIV care and treatment data	2	0.5%	7	1.8%	375	97.7%	384
Centralization of EMR improves the valuable use of information in patient management	2	0.5%	13	3.4%	369	96.1%	384
There is improved data security and use of this EMR	1	0.3%	26	6.8%	357	93.0%	384
Centralization of EMR has improved HIV data validation	1	0.3%	29	7.6%	354	92.2%	384
The use of centralized EMR improves the speed of exchange of HIV patient data	7	1.8%	17	4.4%	360	93.8%	384

### Influence of social demographics on user perception

The analysis found significant associations between user perceptions of the EMR system and socio-demographic factors. Clinical staff had more favorable perceptions than allied workers ( $p=0.011$ ). Divorced individuals had a higher proportion of favorable perceptions. (Fisher's exact  $p=0.006$ ). Perceptions also varied by cadre ( $\chi^2=6.51$ ,  $p=0.011$ ). However, there were no significant associations between education levels, gender, or health facility levels and perceptions of the EMR system. Higher education levels correlated with a more positive perception of EMR systems. Healthcare workers with a bachelor's degree or higher expressed higher satisfaction, particularly in data accuracy and task efficiency, than those with diplomas.

Table 4.3: Associations between socio-demographic and user perception.

Health facility	Favorable N (%)	Unfavorable N (%)	
Level 3- Health Centre	31(16.9)	23(11.5)	
Level 4-Sub County Hospital	66(35.9)	96(48.0)	
Level 5-County Referral	74(40.2)	70(35.0)	$6.36(3)$ , $p=0.095$
Level 6- National Referral	13(7.1)	11(5.5)	
<b>Gender</b>			
Female	92(50.0)	105(52.5)	
Male	92(50.0)	95(47.5)	$0.23(1)$ , $p=0.624$
<b>Marital</b>			
Divorced	8(4.4)	2(1.0)	
Married	116(63.0)	128(64.0)	
Single	54(29.4)	70(35.0)	<i>Fisher's exact</i> $p=0.006$
Widowed	6(3.3)	0(0.0)	
<b>Education</b>			
Master's degree	3(1.6)	3(1.5)	
Bachelor's degree	48(26.1)	42(21.0)	
Higher National Diploma	17(9.2)	12(6.0)	<i>fisher's exact</i> $=0.137$
College Diploma	116(63.0)	143(71.5)	
<b>Cadre category</b>			
Clinical staff	88(47.8)	70(35.0)	
Allied worker	96(52.2)	130(65.0)	$6.51(1)$ , $p=0.011$

### User perception analysis among health care workers

This analysis highlights key factors influencing healthcare workers' perceptions of centralized EMRs.

**Age:** Age was a significant factor (AOR = 0.932, CI: 0.87–0.999,  $p = 0.045$ ), indicating that older healthcare workers were less likely to perceive centralized EMRs favorably, consistent with global trends in digital adaptation challenges according to Logistic regression analysis comparing healthcare workers below 35 had a higher likelihood of favorable EMR perception compared to those over 35.

**Cadre:** Allied health workers (e.g., pharmacists, laboratory technicians) showed a generally more favorable perception of EMRs than clinical staff (e.g., nurses, clinical officers), with an odds ratio of 1.84 (AOR = 1.84, CI = 1.145-3.123,  $p = 0.013$ ), indicating that allied workers were more likely to have an unfavorable perception towards centralized EMRs. This difference may reflect variations in daily usage and specific EMR-related tasks across roles.

However, **years of service** (AOR = 1.045,  $p = 0.243$ ) and years of experience in HIV care (AOR = 1.083,  $p = 0.089$ ) were not significantly associated with EMR perception

**Gender and marital status** also did not significantly influence EMR perceptions, though single respondents (AOR = 4.988,  $p = 0.06$ ) showed a marginally significant effect.

Table 4.4: User perception of centralized EMR .

User perception	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
					lower	Upper
<b>Cadre</b>						
Clinical staff	<b>Ref</b>					
Allied worker	1.891	0.484	2.489	<b>0.013</b>	1.145	3.123
Age of respondents	0.932	0.033	-2.001	<b>0.045</b>	0.87	0.999
Years of service	1.045	0.039	1.168	<b>0.243</b>	0.971	1.124
Years of service in HIV	1.083	0.051	1.698	<b>0.089</b>	0.988	1.187
<b>Gender</b>						
Female	<b>Ref</b>					
Male	1.065	0.265	0.254	<b>0.8</b>	0.654	1.734
<b>Marital status</b>						
Divorced	<b>Ref</b>					
Married	3.807	3.163	1.609	<b>0.108</b>	0.747	19.395
Single	4.988	4.268	1.878	<b>0.06</b>	0.932	26.681
constant	0	0	-5.468	<b>0.001</b>	0	0.001

### Discussion

The findings of this study demonstrate that centralized Electronic Medical Records (EMRs) significantly enhance healthcare delivery, particularly in HIV care, by improving data access, accuracy, and security. Healthcare workers' perceptions of centralized EMRs are pivotal for creating a successful digital health ecosystem in Kenya as the country transitions to universal health coverage. Understanding these views is essential for smooth integration and the development of a unified standard that can be implemented nationwide.

Overall, centralized EMR systems were well-received by healthcare workers, though perceptions varied based on socio-demographic factors. Marital status and educational attainment influenced these views. Most respondents were married (61.2%), with 56.5% holding diplomas and 19.1% possessing bachelor's degrees. Allied health workers, who formed 58.8% of respondents, demonstrated their key role in EMR usage. The average participant age was 32.5 years, with six years of experience in HIV care. Most participants acknowledged the benefits of EMRs, including improved accuracy (94%), better task distribution (95.3%), enhanced HIV care data completeness (97.6%), improved data security (93%), and faster information exchange (96.1%).

Despite these benefits, concerns remained, particularly about data centralization in HIV care. Over half of respondents raised privacy concerns, highlighting a disconnect between education and practical system use, with college-educated respondents more skeptical of EMRs. Older healthcare workers were less receptive to EMRs, reflecting broader trends in digital adaptation (Alanazi et al., 2020). Frequent interactions with EMRs led allied health workers to express mixed perceptions, balancing operational challenges with system advantages. These findings emphasize the need for targeted training and system improvements.

Conversely, younger healthcare workers and clinical staff, such as doctors and nurses, reported more favorable attitudes toward EMRs, valuing them for streamlining workflows and enhancing patient care. This aligns with the Technology Acceptance Model (TAM) (Davis, 1989), which highlights the importance of perceived ease of use and usefulness in technology adoption. However, the skepticism of college-educated professionals underscores the need to bridge gaps between academic preparation and real-world applications through digital literacy and targeted training.

The study highlighted the substantial benefits of centralized EMRs, with nearly all respondents acknowledging improvements in data completeness, task distribution, security, and interdepartmental information exchange. These features are particularly critical in HIV care, where timely and accurate data are vital for effective treatment. However, privacy concerns about centralized data storage remain significant. However, privacy concerns about centralized data storage remain a significant challenge, especially in sensitive areas like HIV care. These findings align with previous studies (Kimenyi et al., 2020), which underscore the importance of robust security measures to build trust in centralized systems.

To enhance EMR adoption and usability, role-specific training and streamlined system functionalities are recommended. Tailored training for older professionals and allied health workers can address skill gaps, while simplified interfaces can minimize administrative burdens. A recent study in Kenya (Tom et al., 2023) corroborates this, revealing that healthcare workers rely on routine health data but need systems that align better with their workflows. Further a study by Ogondi et al. (2018), also found that the

perceived quality of HIV/AIDS data in CBHIS is influenced by staff education level, availability of computers, and performance of data quality checks

Decisions are often influenced by health needs, cost considerations, personal preferences, and directives from superiors, rather than being solely evidence-based.

Additionally, integrating digital literacy programs into academic curricula and workplace initiatives can better prepare healthcare workers to engage with EMR systems effectively. Strengthening data privacy frameworks is equally essential to alleviate skepticism and ensure compliance with ethical standards.

In conclusion, while centralized EMRs are widely recognized for their transformative impact on healthcare, addressing variations in user perceptions through targeted interventions is crucial for maximizing their potential. A user-centered approach, emphasizing digital literacy, role-specific training, and robust privacy measures, is necessary to ensure equitable adoption and improve the quality and efficiency of HIV care delivery. These efforts can pave the way for broader acceptance of EMRs and their successful integration into diverse healthcare settings.

## **Conclusion**

This study underscores the pivotal role of socio-demographic in shaping healthcare workers' perceptions and the adoption of centralized Electronic Medical Records (EMRs) in HIV care and treatment. Age and cadre significantly influence perceptions, with younger healthcare workers and clinical staff demonstrating greater acceptance, while older and non-clinical workers, especially allied health workers, exhibit reservations. These findings align with previous studies, including Kang'a et al. (2007), which highlighted positive perceptions of electronic systems among healthcare providers in HIV care centers, further emphasizing the importance of engagement and support tailored to specific groups.

Although over half of participants expressed unfavorable views of centralized EMRs, positive perceptions among clinical staff highlight the impact of frequent and direct system interactions. Key barriers, such as funding constraints, gaps in digital literacy, and technical challenges, particularly in rural settings, hinder EMR sustainability and efficiency. These align with (Mwangi et al. 2023), demonstrating the need for addressing foundational infrastructure and practical system limitations.

Despite these challenges, centralized EMRs deliver significant benefits, including improved data accuracy, security, completeness, and information exchange. These systems address critical needs in HIV care by enabling timely and accurate data management essential for effective patient care. However, privacy concerns surrounding centralized data storage remain prevalent, echoing findings by (Kimenyi et al.2020), which highlight the importance of robust security measures to build trust among healthcare providers.

To fully realize the benefits of centralized EMRs, targeted solutions are required. Tailored training programs addressing the needs of older professionals and allied health workers can bridge skill gaps, while simplified system interfaces can reduce administrative burdens. The Technology Acceptance Model (TAM) (Davis, 1989) further highlights the importance of perceived ease of use and usefulness, reinforcing the need for systems designed to enhance user satisfaction and productivity. Role-specific training and continuous system improvements are crucial for overcoming skepticism and operational challenges.

Ultimately, centralized EMRs offer transformative potential for improving HIV care in Kenya, but their success depends on a holistic approach to implementation. By addressing socio-demographic and fostering digital literacy, and ensuring robust infrastructure and security, Kenya can strengthen its digital health ecosystem. These findings provide valuable evidence to guide policymakers in scaling up EMR adoption, supporting universal health coverage, and optimizing healthcare delivery for improved patient outcomes.

As Kenya continues its journey toward universal health coverage and a unified digital health ecosystem, the findings emphasize the importance of investing in EMR infrastructure, implementing role-specific training programs, and refining system designs. By addressing these critical factors.

## **Recommendations**

Health departments and other policy makers to develop tailored training initiatives to enhance digital literacy among healthcare workers, focusing on specific groups such as older professionals and allied health staff.

Recommend government to invest in robust infrastructure to ensure healthcare facilities have access to functional devices, reliable internet connections, and streamlined system interfaces that reduce administrative burdens.

Governments to use the study findings to advice the expansion of national wide and health facility wise centralized medical records by the Ministry of health and all levels of governance to understand factors affecting user perception to ease acceptance.

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