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Assessing the Training Gaps and Support Needs of Healthcare Providers Regarding the Effective Use of Electronic Community Health Information System in Awendo and Nyatike Sub Counties, Migori County, Kenya Based on TAM Framework

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Abstract

Purpose: The effective implementation of Electronic Community Health Information Systems (e-CHIS) in low-resource settings is critically dependent on the digital proficiency of healthcare providers. This study investigated the training gaps and support needs that influence e-CHIS adoption in Migori County, Kenya.

Methodology: A cross-sectional mixed-methods design was employed, collecting quantitative data from 357 healthcare providers via a structured survey, with data analyzed using descriptive/inferential statistics and bivariate correlation in SPSS. This was complemented by qualitative insights from 14 key informant interviews and 25 focus group discussions, which were transcribed verbatim and analyzed using thematic and content analysis.

Findings: While analysis revealed near-universal training coverage (96.4%) and high ratings of training quality (94.2% good/excellent), significant implementation barriers persisted. A striking 85.2% of health care providers experienced technical challenges while 91.6% reported technical infrastructure as a major barrier. Furthermore, a pronounced disparity in access to technical support was found between sub-counties (Awendo 59.7% vs. Nyatike 85.0%). TAM analysis confirmed a strong correlation between Perceived Ease of Use and Perceived Usefulness ($r=0.870$, $p<0.001$), validating the model's core premise. However, a critical and unexpected finding emerged: technical skill level showed a non-significant negative correlation with Perceived Usefulness ($r=-0.019$, $p=0.715$), challenging conventional assumptions that digital literacy directly translates to system appreciation.

Unique contribution to theory, practice and policy: The study concludes that despite high training coverage, a fundamental disconnect exists between training efforts and sustainable system adoption, driven by systemic infrastructure and support limitations. These findings necessitate a theoretical refinement of technology acceptance models for resource-constrained contexts and recommend a strategic shift from one-time training to integrated, continuous support and context-sensitive implementation strategies to unlock the full potential of digital health tools.

Keywords: *Electronic Community Health Information Systems, Health Care Providers, Training Gaps, Support Needs, Technology Acceptance Model (TAM), Digital Health*

1. Background of the Study

In the current era where digital transformation is reshaping community health services delivery, electronic community health Information Systems (e-CHIS) have emerged as a comprehensive tool for effective and efficient in enhancing community based health services as essential tools for improving community-level health data management, service delivery, and population health outcomes, these systems facilitate the collection, storage, analysis, and dissemination of health data at the community level of service delivery, enabling healthcare providers to offer quality services, track patient outcomes, and coordinate care more efficiently. However, the successful implementation and utilization of e-CHIS hinge on the capacity of healthcare providers, who often serve as the frontline interface between technology and community health needs to use the system proficiently. Despite the contribution of this digital system to improve health equity and operational efficiency, persistent training gaps and inadequate support mechanisms continue to hinder their effective utilization and maximalizing on benefits in Awendo and Nyatike sub counties, Migori county, Kenya, which are zooned as area in resource limited settings.

This assessment aims to examine the training gaps and support needs of healthcare providers in the effective use of eCHIS, with a focus on key objectives related to skills and knowledge, perceived benefits, and challenges. By evaluating the current knowledge and skills in using e-CHIS such as data entry, system navigation, and basic troubleshooting, this study seeks to identify areas where training interventions are most urgently required, the mode of preferred training and frequency of training. Furthermore, it explores the perceived benefits, including enhanced data accuracy, reduced paper burdens, and improved patient engagement, which can motivate providers to embrace these technologies. Concurrently, the assessment addresses prevalent barriers, such as limited access to technology, lack of motivation, lack of adequate training, system inefficiencies, limited access to training resources, technological barriers like unreliable internet connectivity, and resistance due to perceived complexity or time constraints.

This study is based on the Technology Acceptance Model (TAM), which posits that technology adoption is driven by perceived usefulness (PU), the degree to which users believe the system enhances job performance and perceived ease of use (PEOU), the extent to which the system is seen as effortless to operate (Davis, 1989). In the context of eCHIS, PU aligns with recognized benefits such as timely data availability and improved health outcomes, while PEOU corresponds to the usability of the system and the adequacy of training in building operational confidence. TAM has been widely validated in health information technology adoption studies, demonstrating that targeted training significantly strengthens PEOU, while ongoing technical support and demonstrable system benefits enhance PU, leading to sustained use (Holden & Karsh, 2010; Rahimi et al., 2018). By applying TAM as a theoretical framework, this assessment not only identifies critical gaps in skills, knowledge, training and support but also links these deficiencies to providers' acceptance and sustained engagement with eCHIS. The findings will inform the

design of competency-based training programs, user-centered support systems, and policy recommendations to optimize eCHIS implementation. Ultimately, addressing these gaps through a TAM informed approach will strengthen healthcare provider capacity, enhance system utilization, and contribute to achieving equitable, data-driven community health services in correction with national and global health priorities. This study not only identifies gaps but also proposes strategies to foster positive perceptions and mitigate barriers, drawing on empirical insights from similar implementations. Through a comprehensive analysis of these elements, this work contributes to the development of targeted training programs and support strategies that empower healthcare providers, ultimately fostering a more robust and sustainable e-CHIS ecosystem. By bridging these gaps, we can unlock the full potential of digital health tools to advance community health outcomes and align with global health priorities, as those outlined in the Sustainable Development Goals.

1. Materials and Methods

2.1 Study Design

The study adopted a mixed-method design. This cross-sectional study was carried out among healthcare providers in Nyatike and Awendo sub-counties in Migori county. Purposive sampling was employed to select Nyatike and Awendo sub-counties. simple random sampling was employed to select 357 health care providers. A structured Questionnaire was used to collect data from the sampled 357 health care provider. Stratified random sampling was employed to selected 25 community health units where 25 Focus Group Discussion with a total of 12 community health promoters per session per FGD were conducted. In-depth interviews, 17 KIIs with key informant's sub county health management team members were conducted, data analysis conducted using SPSS version 21.0.

2.2 Study Setting

This research used a cross-sectional design and was carried out in the sub-counties of Nyatike and Awendo of Migori County, focusing training gap and support needs in the adoption of Electronic Community Health Information System (e-CHIS) in community health services. The two sub-counties were purposively chosen because they had both implemented the e-CHIS more than two years. Migori County is administratively divided into eight sub-counties: Suna West, Suna East, Nyatike, Awendo, Uriri, Rongo, Kuria East, and Kuria West.

2.3 Study Participations

The study population compasses the service users and all healthcare providers supervising the community health services within the Awendo and Nyatike subs counties. The study setting was Nyatike and Awendo sub-counties were purposively selected because of implemented e-CHIS for more than two years. The study population consisted of health care providers working in or administering community health services in Nyatike and Awendo sub-counties. This included

Community Health Promoters (CHPs), Community Health Assistants (CHAs), Public Health Officers, and members of the Sub-County Health Management Teams (SCHMT) who utilize e-CHIS in service delivery and supervision.

2.3.1 Inclusion Criteria

Eligible respondents for this study included healthcare providers aged 18-60 years who had worked in Nyatike and Awendo sub-counties for at least 2 years, provided informed consent, and were directly involved in e-CHIS use. Nyatike and Awendo were purposively selected since the two sub-counties had implemented e-CHIS for more than 2 years while the other six sub-counties had implemented e-CHIS for less than two years.

2.3.2 Exclusion Criteria

Healthcare providers from Uriri, Rongo, Suna East, Kuria East, Suna West and Kuria West sub-counties that had implemented e-CHIS for less than two years were excluded from the study. Additionally, healthcare providers who met the inclusion criteria but declined to consent, or had worked in Nyatike and Awendo for less than two years, were not included.

2.3.3 Sampling Design

A simple random sampling approach was used to select CHPs, CHAs, PHOs and SCHMT members in each of the sub-counties. A structured questionnaire was administered to 357 health care providers. Additionally, 25 community health units were selected using stratified randomly for Focus Group Discussions (FGD), each with 12 participants. In-depth interviews were carried out with 14 key informants (KII) from the sub-county health management teams.

2.3.4 Sample Size

- Community Health Promoters: 303
- Community Health Assistants: 29
- Public Health Officers: 25
- Sub County Health Management Team: 14 (KIIs)
- Community Health Units 25 (25 FGDs with 12 Community Health Promoters)

2.4 Data Collection Tools

The study utilized both quantitative and qualitative data collection methods.

2.4.1 Quantitative Data Collection

The survey was conducted using a questionnaire administered to 357 health care providers from Awendo and Nyatike Sub counties, this study investigated the training gaps and support needs that influence e-CHIS utilization in Migori County, Kenya. The survey encompassed inquiries

regarding several aspects of e-CHIS training gaps and support needs including the skills and knowledge, training quality, perceived benefits and challenges in regard to training and support needs. The structured questionnaire was developed based on the Technology Acceptance Model (TAM) theoretical framework (Davis, 1989), assessing constructs such as adoption and sustained use, perceived ease of use, perceived usefulness, intention to use, and facilitating conditions. The items were rated on a 5-point Likert scale: Strongly Disagree (1) to Strongly Agree (5). The TAM framework was specifically suitable for this study as it provides an extensive understanding of how healthcare providers perceive, accept, and use digital health technologies. It emphasizes the role of perceived usefulness and ease of use in determining user acceptance, adoption, and continued utilization. The Facilitating conditions construct evaluated whether respondents had resources, adequate infrastructure and knowledge to effectively utilize e-CHIS. Data were collected using an online survey tool, *CommCare*.

2.4.2: Qualitative Data Collection

A long with the 357 structured questionnaire administered, additionally, 25 Focus Group Discussions (FGDs (Awendo 10 and Nyatike 15), each with 12 participants and In-depth interviews were carried out with 14 Key Informant Interviews (KIIs) (Awendo 7 and Nyatike 7) from the sub-county health management teams. The FGDs were conducted with CHPs to explore factors influencing training gap and support needs sustained use to use e-CHIS. Discussion guides were structured, all sessions audio-recorded with participant consent, and notes taken to capture contextual details. The KIIs were held with sub-county health management team members using a semi-structured interview guide focusing on their perspectives to identify recurring themes and patterns in the FGDs and KIIs transcripts and content analysis was used to analyze the content of the interviews and FGDs to identified specific, challenges and recommendations for strengthening e-CHIS implementation. All discussions were conducted privately to ensure confidentiality and promote open dialogue. The interviews were transcribed verbatim and analyzed thematically.

2.5 Bias

To ensure validity and reduce bias in the questionnaire for this study on e-CHIS training gaps in Awendo and Nyatike sub-counties, the following measures were implemented based on the TAM framework, to minimize bias in this study expert review was done by three experts for clarity and relevance of the questionnaires, pilot tested of the data collection tools was conducted with 36 health care providers which included the Public Health Officers 3, community health assistants 3, and community health promoter 30 in Rongo sub-county to fix wording, flow, translation and comprehension issues, anonymity assurance was ensured by self-administered questionnaires with codes only to reducing social desirability, mixed sampling method of stratified random and simple random sampling approach were used to avoid selection bias and mixed data collection tools are used for triangulation and generation of the findings.

2.6 Statistical Methods

Quantitative data were analyzed through descriptive and inferential statistics. Descriptive statistical methods were used to present demographic information for each participant and to show how each study variable was distributed, including frequency, percentage, mean and standard deviation of participants in each sub-county (Awendo and Nyatike). Inferential statistical methods were used: Pearson's Chi-squared test was used to detect significant differences between categorical variables and Welch's t-test was subsequently conducted to detect significant differences in the means of continuous variables. To investigate core relationships put forward by Technology Acceptance Model (TAM), Pearson's r was used to assess correlations between constructs, such as Perceived Ease of Use (PEOU), Perceived Usefulness (PU), quality of training received and perceived skill level. All quantitative analysis was carried out using IBM SPSS Statistics Software Version 21 and a statistical significance level was set for all analyses at p value less than 0.05.

The qualitative data collected from the 25 Focus Group Discussions (FGDs) and 14 Key Informant Interviews (KIIs) were analyzed thematically. After transcribing each Focus Group Discussion and Key Informant Interview verbatim, an inductive method for coding was utilized to categorize the data by grouping together identified themes and identifying similarities across the data set based on what concepts, experiences, and patterns were occurring in the transcribed text. The initial codes were then grouped into broader categories, which were reorganized and refined to better capture the various facilitators and barriers to e-CHIS training and support needs that had been identified throughout the process. Manual coding and thematic synthesis techniques were used to aid in the organisation and finalising of the findings.

In addition to these qualitative data collection and analysis methods, triangulation was used to validate findings from quantitative analyses against qualitative findings. For example, by integrating quantitative findings with qualitative data, triangulation was used to provide convergent validation for statistical relationships and to inform deeper contextual perspectives regarding statistical relationships and to clarify reasons for paradoxical and/or complex statistical findings. Furthermore, this mixed-methods analytical strategy enhanced how findings were interpreted, and how a more comprehensive understanding could be developed regarding the increasing of e-CHIS adoption in Kenya and accessing training gaps and training support needs.

3. Results

3.1 Demographic Characteristics of Study Participants

The study included 357 healthcare providers from Nyatike (n = 213, 59.7%) and Awendo (n = 144, 40.3%) sub-counties in Migori County, Kenya. The mean age of participants was 42.01 years (SD = 10.31), with a statistically significant difference between sub-counties ($p < 0.001$). Providers in Awendo were significantly older (M = 44.28, SD = 9.02) compared to those in Nyatike (M =

40.48, SD = 10.85). Age distribution across categories revealed that the largest proportion of providers were in the 40-49 years category (31.7%), followed by 30-39 years (27.7%), ≥50 years (25.2%), and <30 years (15.4%). The sample comprised 254 female providers (71.1%) and 103 male providers (28.9%), with a statistically significant gender distribution difference between sub-counties ($p = 0.002$). Awendo had a higher proportion of female providers (80.6%) compared to Nyatike (64.8%). Educational levels varied among participants, with the largest group having primary/secondary education (38.1%), followed by certificate holders (27.5%), diploma holders (18.2%), and degree/other qualifications (16.2%). No statistically significant differences were found in educational attainment between sub-counties ($p = 0.116$), though Nyatike had slightly higher proportions of diploma (20.7% vs 14.6%) and degree holders (18.8% vs 12.5%) compared to Awendo. Most providers were married (76.4%), followed by widowed (19.7%), and single (3.9%). Marital status distribution showed no significant differences between sub-counties ($p = 0.082$), though Nyatike had a higher proportion of married providers (78.3% vs 73.6%) and Awendo had more widowed providers (24.3% vs 16.5%). Residential patterns revealed that the vast majority lived in rural areas (93.6%), with a statistically significant difference between sub-counties ($p = 0.022$). Nyatike had a higher proportion of rural residents (96.2%) compared to Awendo (89.6%). The demographic profile reveals a predominantly female, experienced workforce with good educational backgrounds and nearly universal e-CHIS training exposure, providing a solid foundation for examining training gaps and support needs in the subsequent analyses. **Table 1** presents the comprehensive demographic characteristics of the study participants.

Table 1: Demographic and Professional Characteristics of Healthcare Provider

Variable	Overall[1]	Awendo N = 144[1]	Nyatike N = 213[1]	p-value[2]
Age (years)	M = 42.01, SD = 10.31	M = 44.28, SD = 9.02	M = 40.48, SD = 10.85	<0.001
Age category				<0.001
<30 years	n = 55.0 (15.4%)	n = 7.0 (4.9%)	n = 48.0 (22.5%)	
≥50 years	n = 90.0 (25.2%)	n = 43.0 (29.9%)	n = 47.0 (22.1%)	
30–39 years	n = 99.0 (27.7%)	n = 44.0 (30.6%)	n = 55.0 (25.8%)	
40–49 years	n = 113.0 (31.7%)	n = 50.0 (34.7%)	n = 63.0 (29.6%)	
Gender				0.002
Female	n = 254.0 (71.1%)	n = 116.0 (80.6%)	n = 138.0 (64.8%)	
Male	n = 103.0 (28.9%)	n = 28.0 (19.4%)	n = 75.0 (35.2%)	
Education level				0.116
Primary/Secondary	n = 136.0 (38.1%)	n = 60.0 (41.7%)	n = 76.0 (35.7%)	
Certificate	n = 98.0 (27.5%)	n = 45.0 (31.3%)	n = 53.0 (24.9%)	
Diploma	n = 65.0 (18.2%)	n = 21.0 (14.6%)	n = 44.0 (20.7%)	
Degree/Other	n = 58.0 (16.2%)	n = 18.0 (12.5%)	n = 40.0 (18.8%)	
Marital status				0.082
Single	n = 14.0 (3.9%)	n = 3.0 (2.1%)	n = 11.0 (5.2%)	
Married	n = 272.0 (76.4%)	n = 106.0 (73.6%)	n = 166.0 (78.3%)	
Widowed	n = 70.0 (19.7%)	n = 35.0 (24.3%)	n = 35.0 (16.5%)	
Residence				0.022
rural	n = 334.0 (93.6%)	n = 129.0 (89.6%)	n = 205.0 (96.2%)	
urban	n = 23.0 (6.4%)	n = 15.0 (10.4%)	n = 8.0 (3.8%)	

[1]M = Mean, SD = SD; n = n (%)
[2]Welch Two Sample t-test; Pearson's Chi-squared test

3.1.1 Role of the Health Care Providers

The majority of participants were community health promoters (84.9%), followed by community health assistants (8.1%), and public health officers (7.0%). No significant differences were observed in role distribution between sub-counties (p = 0.796). Providers had substantial professional experience, with a mean of 8.96 years (SD = 6.80). **Figure1** highlights the role of health care providers

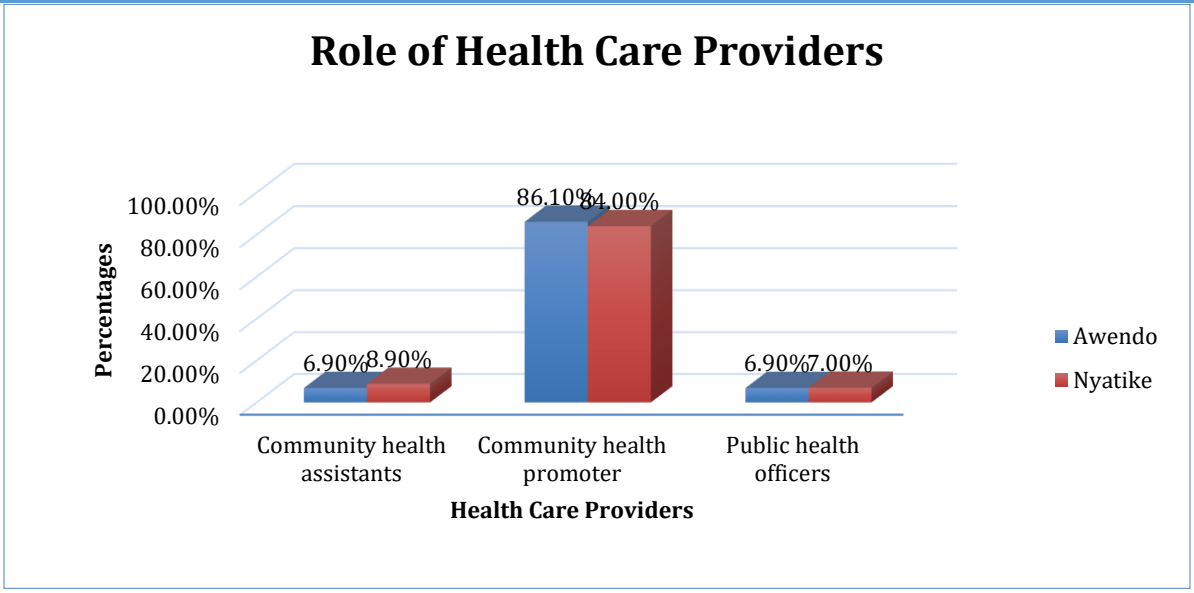

Figure 1: Role of Health Care Providers

3.1.2 Respondents' years of experience in Community Health Services

Experience distribution was relatively balanced: ≤5 years (34.2%), 6-10 years (32.2%), and >10 years (33.6%). A significant difference emerged in experience category distribution between sub-counties (p = 0.037), with Nyatike having a higher proportion of less experienced providers (≤5 years: 39.4%) compared to Awendo (26.4%). **Figure 2** shows further details about demographic information of the study participants.

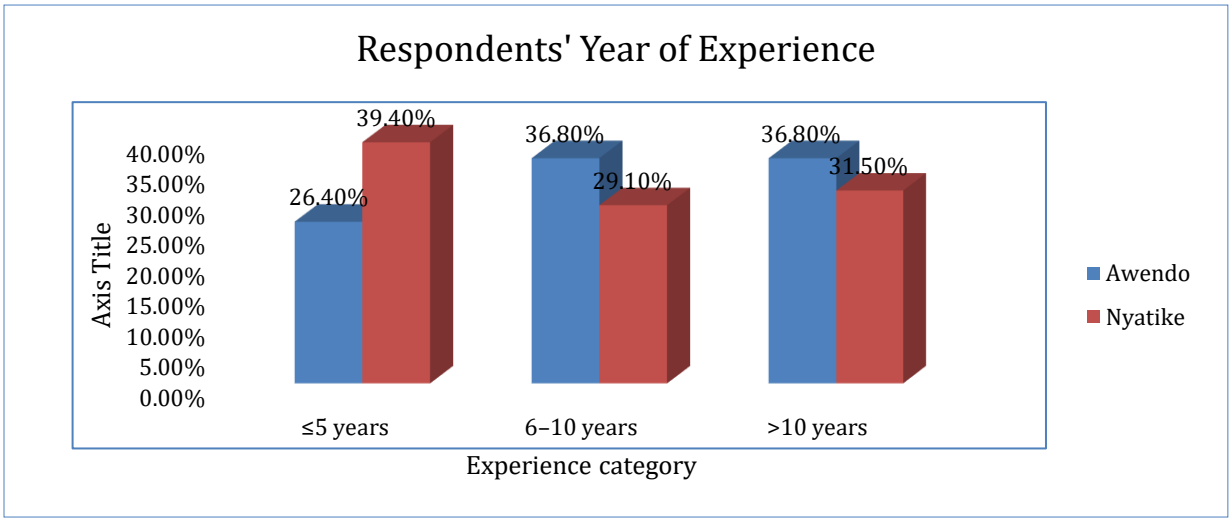

Figure 2: Respondents' Year of Experience

3.1.3 Training Status

Nearly all heath care providers (96.4%) reported receiving e-CHIS training, with no significant difference between sub-counties (p = 0.315). **Figure 3** highlights on the participants who have received training on the use of e-CHIS.

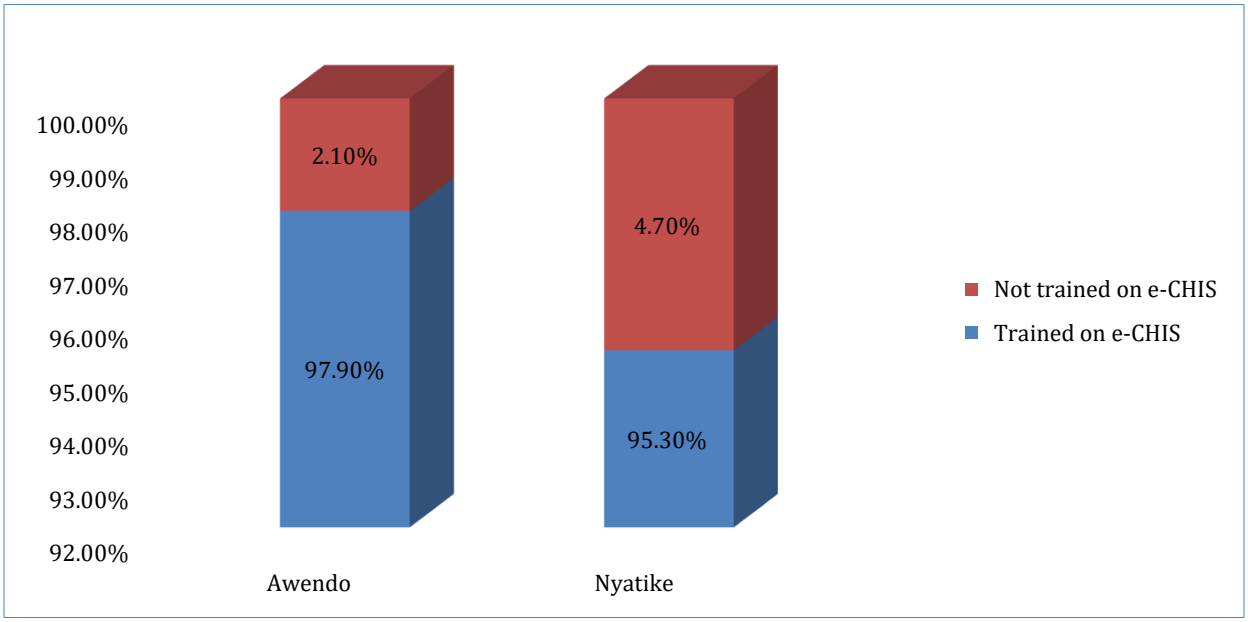

Figure 3: Training Status

Training Quality

3.1.4 Quality of Training Received

Analysis revealed near-universal training coverage, with 96.4% of providers reporting receipt of e-CHIS training, showing no significant difference between sub-counties (p = 0.315). Among those trained, training quality was rated as excellent by 41.9% and good by 52.3% of providers, while only 5.8% rated it as average, with no significant sub-county variation (p = 0.810). **Figure 4** highlights the quality of training received by the healthcare providers.

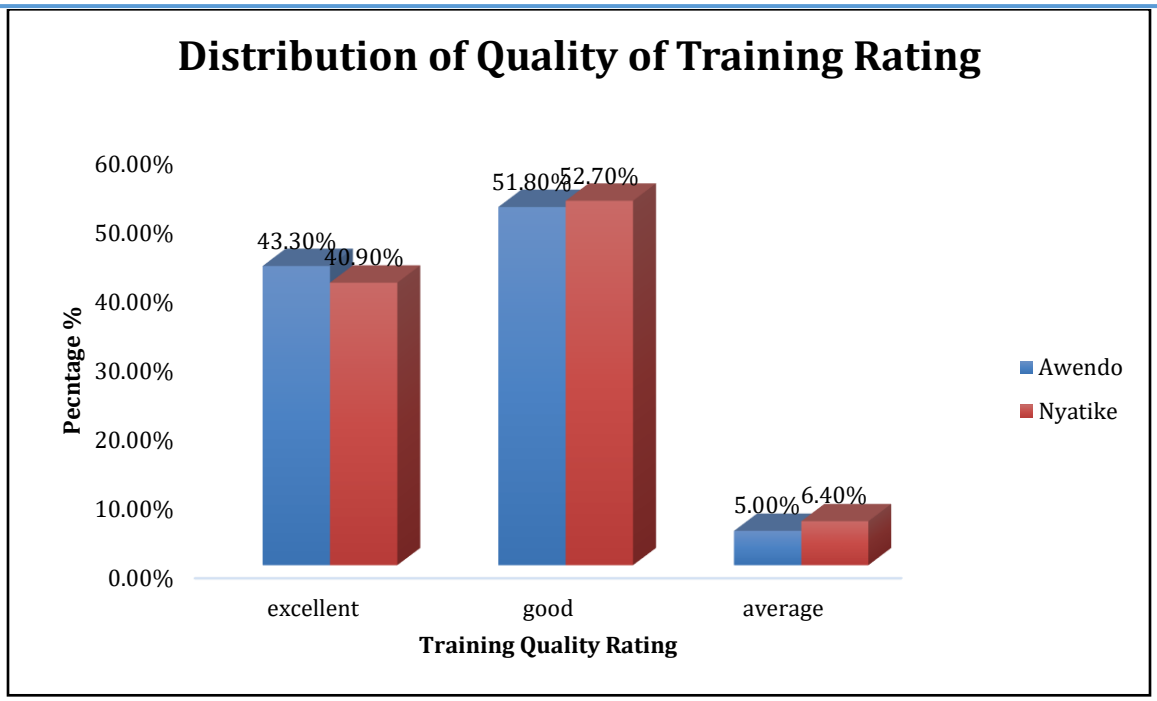

Figure 4*: Distribution of training Quality Ratings*

3.2 Training Gaps and Support Needs

Self-rated e-CHIS skills demonstrated significant variation between sub-counties ($p = 0.008$), with Awendo reporting higher proportions of excellent skills (31.3%) compared to Nyatike (19.2%), while Nyatike had higher proportions of good skills (68.5% vs 55.6%). Only a small minority rated their skills as fair (11.8%) or poor (0.8%), with all poor ratings concentrated in Awendo sub-county (2.1% vs 0.0% in Nyatike).

The comprehensiveness of training was high, with 92.4% of providers indicating that training covered all necessary e-CHIS aspects, showing no significant sub-county variation ($p = 0.287$). Technical support accessibility was reported as adequate by 92.4% of providers overall, with no significant difference between sub-counties ($p = 0.141$). However, substantial differences emerged in perceived ease of access to technical support ($p < 0.001$), with Nyatike providers reporting substantially easier access (85.0% agreed) compared to Awendo (59.7%).

Support needs assessment revealed that 88.5% of providers expressed that they would benefit from dedicated e-CHIS support personnel, with no significant sub-county differences ($p = 0.507$). Similarly, 87.7% of providers indicated that refresher training would be helpful, demonstrating widespread recognition of ongoing learning needs across both sub-counties ($p = 0.119$).

Critical implementation challenges persisted despite comprehensive training efforts. A substantial 85.2% of providers reported experiencing technical challenges, with remarkably consistent prevalence across both sub-counties (Awendo: 85.4%, Nyatike: 85.0%, $p > 0.999$). Data

management challenges were reported by 13.2% of providers, showing no significant sub-county variation ($p = 0.884$). Technical infrastructure barriers affected the vast majority of providers (91.6%), while motivation and incentive barriers were reported by 28.9% of providers. Training-related barriers were identified by 26.1% of providers, with no significant differences observed between sub-counties for any of these barrier categories (technical infrastructure: $p = 0.351$; motivation: $p = 0.230$; training-related: $p = 0.803$). To further elucidate the nature of the prevalent technical infrastructure barriers (reported by 91.6% of providers), qualitative data revealed that the most frequently cited issues were unreliable internet connectivity, inconsistent power supply, insufficient number of shared devices (e.g., tablets, smartphones), and poor mobile network coverage in remote areas. These factors were consistently reported as hindering daily data entry, system synchronization, and access to online support resources. **Table 2** presents the comprehensive assessment of training gaps, support needs, and implementation barriers identified among healthcare providers using the Electronic Community Health Information System (e-CHIS) in Migori County.

Table 2. Training Gaps, Support Needs, and Implementation Barriers for e-CHIS Utilization

Characteristic	Overall N = 357[1]	Awendo N = 144[1]	Nyatike N = 213[1]	p-value[2]
Received e-CHIS training	344.0 (96.4%)	141.0 (97.9%)	203.0 (95.3%)	0.315
Quality of training received				0.810
excellent	144.0 (41.9%)	61.0 (43.3%)	83.0 (40.9%)	
good	180.0 (52.3%)	73.0 (51.8%)	107.0 (52.7%)	
average	20.0 (5.8%)	7.0 (5.0%)	13.0 (6.4%)	
Self-rated e-CHIS skills				0.008
excellent	86.0 (24.1%)	45.0 (31.3%)	41.0 (9.2%)	
good	226.0 (63.3%)	80.0 (55.6%)	146.0 (68.5%)	
fair	42.0 (11.8%)	16.0 (11.1%)	26.0 (12.2%)	
poor	3.0 (0.8%)	3.0 (2.1%)	0.0 (0.0%)	
Training covered all aspects needed	330.0 (92.4%)	130.0 (90.3%)	200.0 (93.9%)	0.287
Technical support accessibility				0.141
Adequate	330.0 (92.4%)	129.0 (89.6%)	201.0 (94.4%)	
Inadequate	27.0 (7.6%)	15.0 (10.4%)	12.0 (5.6%)	
Easy access to technical support				<0.001
Agree	267.0 (74.8%)	86.0 (59.7%)	181.0 (85.0%)	
Disagree/Neutral	90.0 (25.2%)	58.0 (40.3%)	32.0 (15.0%)	
Would benefit from dedicated e-CHIS support				0.507
Agree	316.0 (88.5%)	125.0 (86.8%)	191.0 (89.7%)	
Disagree/Neutral	41.0 (11.5%)	19.0 (13.2%)	22.0 (10.3%)	
Refresher training would be helpful				0.119
Agree	313.0 (87.7%)	121.0 (84.0%)	192.0 (90.1%)	
Disagree/Neutral	44.0 (12.3%)	23.0 (16.0%)	21.0 (9.9%)	
Experiences challenges	304.0 (85.2%)	123.0 (85.4%)	181.0 (85.0%)	>0.999
Experiences data management challenges	47.0 (13.2%)	18.0 (12.5%)	29.0 (13.6%)	0.884
Training-related barriers	93.0 (26.1%)	36.0 (25.0%)	57.0 (26.8%)	0.803
Technical infrastructure barriers	327.0 (91.6%)	129.0 (89.6%)	198.0 (93.0%)	0.351
Motivation/incentive barriers	103.0 (28.9%)	36.0 25.0%)	67.0 (31.5%)	0.230

3.2.1 Training Quality Rating

Bivariate correlation analysis revealed several significant relationships between key study variables. Training quality demonstrated positive correlations with both PEOU ($r = 0.231$, $p < 0.001$) and PU ($r = 0.148$, $p = 0.005$), indicating that higher quality training is associated with more favorable perceptions of both ease of use and usefulness, though these relationships are modest in strength. A particularly strong positive correlation was observed between PEOU and PU ($r = 0.870$, $p < 0.001$), providing robust validation for the theoretical relationship proposed by the TAM framework in this context. Interestingly, self-rated skill levels showed a weak and non-significant negative correlation with PU ($r = -0.019$, $p = 0.715$), suggesting that higher technical skills did not necessarily translate to greater perceived usefulness of the e-CHIS system among providers.

System performance ratings were generally positive across both training quality groups, with providers receiving high-quality training reporting mean satisfaction scores of 4.03 (SD = 0.62) and those with low-quality training reporting 3.95 (SD = 0.94). More pronounced differences emerged in self-rated skill levels, where high-quality training was associated with significantly higher skill ratings ($M = 4.18$, $SD = 0.57$) compared to low-quality training ($M = 3.35$, $SD = 0.59$), indicating that training quality may have a more direct impact on skill development than on acceptance perceptions. The **figure 5** below of scatter plot with regression line showing the positive correlation between training quality scores and perceived ease of use (PEOU) scores ($r = 0.231$, $p < 0.001$) among healthcare providers using Electronic Community Health Information Systems (e-CHIS) in Migori County, Kenya. The analysis indicates that higher quality training is associated with better usability perceptions of the e-CHIS system, though the relationship is moderated by other contextual factors in this resource-limited setting

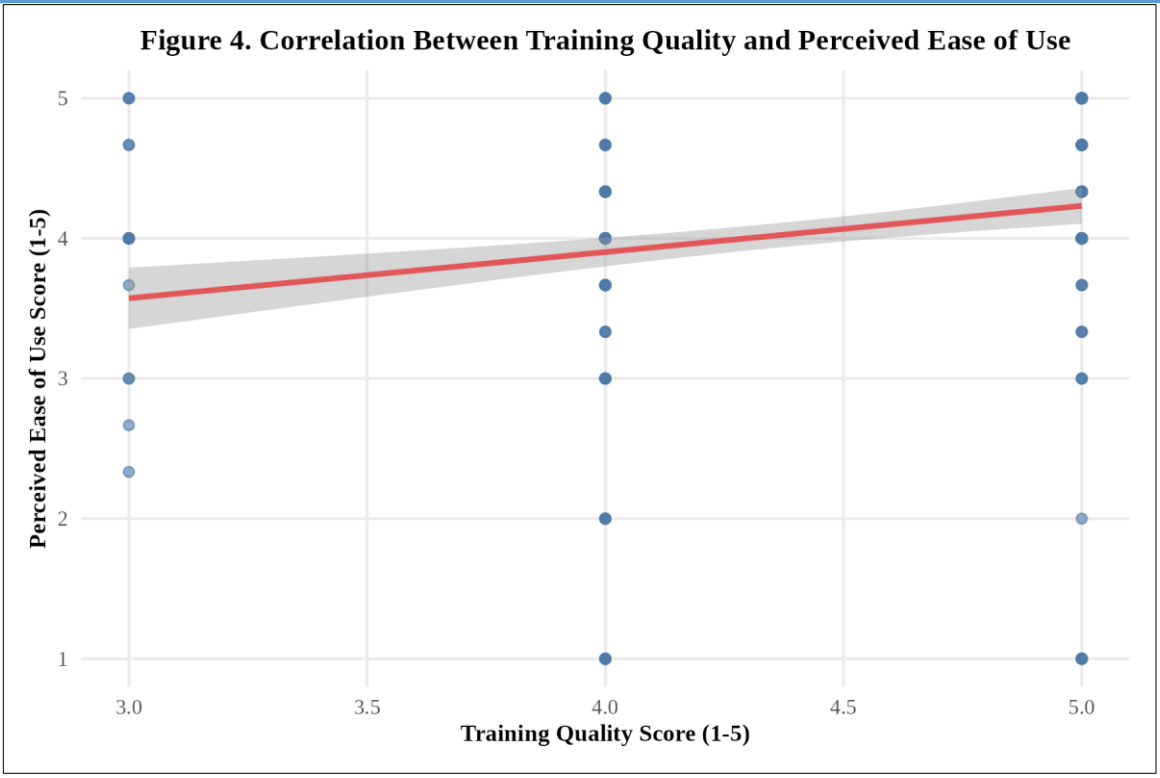

Figure 5: positive correlation between training quality scores and perceived ease of use

3.3 Technology Acceptance Model Analysis

The application of the Technology Acceptance Model (TAM) framework revealed important insights into the relationship between training quality and system acceptance among healthcare providers. Providers who received high-quality training (n = 324) demonstrated marginally higher Perceived Ease of Use (PEOU) scores (M = 4.03, SD = 0.85) compared to those who received low-quality training (n = 20; M = 3.95, SD = 0.74). Conversely, for Perceived Usefulness (PU), the low-quality training group reported slightly higher scores (M = 4.18, SD = 0.61) compared to the high-quality group (M = 4.06, SD = 0.95). Independent t-tests revealed no statistically significant differences in either PEOU (p = 0.666) or PU (p = 0.448) between the training quality groups, suggesting that while training quality may influence acceptance perceptions, the effects are not statistically significant in this sample.

Table 3 presents the comprehensive TAM analysis stratified by training quality groups.

Table 3. Impact of Training Quality on Technology Acceptance and System Performance

Training Group	Quality	N	PEOU Score	PU Score	Skill Level	System Performance	PEOU p-value	PU p-value
High Training	Quality	324	4.03 (0.85)	4.06 (0.95)	4.18 (0.57)	4.03 (0.62)	0.6655	0.4477
Low Training	Quality	20	3.95 (0.74)	4.18 (0.61)	3.35 (0.59)	3.95 (0.94)		

PEOU = Perceived Ease of Use; PU = Perceived Usefulness; Independent t-tests show significant differences between training quality groups

3.4 Summary of the Key Finding

The key findings from e-CHIS implementation analysis. ***(A)*** Distribution of training quality ratings showing majority of providers rated training as good or excellent. ***(B)*** Technology Acceptance Model (TAM) construct scores by training quality groups, demonstrating variations in perceived ease of use and perceived usefulness. ***(C)*** Prevalence of technical challenges highlighting persistent system navigation and troubleshooting issues. ***(D)*** Correlation between training quality and perceived ease of use scores ($r = 0.231$, $p < 0.001$) indicating the relationship between training quality and system usability perceptions. All analyses based on data from 357 healthcare providers across Nyatike and Awendo sub-counties.

3.5 Sub-County Comparative Analysis

Comparative analysis between Nyatike and Awendo sub-counties revealed several noteworthy patterns in training experiences and system acceptance. While both sub-counties achieved near-universal training coverage, distinct differences emerged in the implementation experience. Awendo providers reported substantially greater challenges with technical support accessibility, with 40.3% disagreeing or being neutral about easy access compared to only 15.0% in Nyatike, suggesting potential disparities in technical infrastructure or support service distribution between the sub-counties.

The distribution of technical challenges was remarkably consistent across sub-counties (85.4% in Awendo vs. 85.0% in Nyatike), indicating that technical difficulties represent a systemic issue affecting e-CHIS implementation regardless of geographical location or sub-county characteristics. Motivation and incentive barriers showed a trend toward higher prevalence in Nyatike (31.5%) compared to Awendo (25.0%), though this difference did not reach statistical significance ($p = 0.230$), potentially reflecting variations in implementation approaches or contextual factors between the sub-counties.

The TAM construct scores demonstrated relative consistency between sub-counties, with no significant differences in either PEOU ($p = 0.515$) or PU ($p = 0.751$) scores, suggesting that the core technology acceptance factors operate similarly across different sub-county contexts despite variations in demographic characteristics and support access experiences.

4. Discussion

This study successfully addressed the research objective to identify the training gaps and support needs of healthcare providers regarding the effective use of e-CHIS in Nyatike and Awendo sub-counties. The findings reveal a complex implementation landscape where significant achievements in training coverage coexist with persistent challenges in quality assurance, technical support systems, and technology acceptance.

The results demonstrate substantial alignment with existing literature while revealing important contextual specificities. The near-universal training coverage (96.4%) reflects the successful implementation of Kenya's digital health strategy as outlined in the Kenya Health Policy 2014-2030, confirming the government's commitment to digital health transformation. However, the persistence of quality variations, with 5.8% of providers receiving only average-quality training, supports Kansiime et al.'s (2024) findings on the challenges of maintaining consistent training quality in resource-limited settings. The significant sub-county variation in self-rated e-CHIS skills ($p = 0.008$) further emphasizes the need for context-sensitive training approaches rather than standardized implementation models.

The Technology Acceptance Model framework provided valuable insights into the relationship between training interventions and system acceptance. The strong positive correlation between Perceived Ease of Use and Perceived Usefulness ($r = 0.870$, $p < 0.001$) validates Davis's (1989) foundational TAM propositions in this context. The positive correlations between training quality and both PEOU ($r = 0.231$, $p < 0.001$) and PU ($r = 0.148$, $p = 0.005$) demonstrate that training serves as a significant external variable affecting core TAM constructs, supporting Holden and Karsh's (2010) emphasis on training's role in technology acceptance.

However, several findings challenge conventional applications of technology acceptance models in this context. The absence of statistically significant differences in PEOU ($p = 0.666$) and PU ($p = 0.448$) between high and low-quality training groups, despite positive correlations, presents an important paradox that requires theoretical reconciliation. Most notably, the weak negative correlation between self-rated skills and PU ($r = -0.019$, $p = 0.715$) fundamentally challenges assumptions about digital literacy and technology acceptance, contradicting Rahimi et al.'s (2018) conclusion that technical competence naturally enhances perceived usefulness.

The persistence of technical challenges among 85.2% of providers despite comprehensive training directly supports Aker and Mbiti's (2010) research on infrastructure limitations as fundamental barriers in rural digital health implementations. The remarkable consistency of these challenges

across both sub-counties ($p > 0.999$) confirms that technical barriers represent systemic rather than localized issues. The substantial disparity in technical support access between sub-counties ($p < 0.001$) extends existing literature by demonstrating how uneven support systems create significant variations in user experiences within the same implementation framework.

The overwhelming demand for refresher training (87.7%) and dedicated support personnel (88.5%) strongly aligns with Feroz et al.'s (2020) recommendations for continuous professional development in digital health, confirming that one-time training approaches are insufficient for sustainable implementation. The finding that 91.6% of providers identified technical infrastructure as a major barrier aligns with known challenges in rural digital health implementations (Aker & Mbiti, 2010; Feroz et al., 2020). The qualitative insights specify that these barriers are primarily rooted in unreliable electricity and internet connectivity, a scarcity of functional devices, and weak network signals systemic issues that training alone cannot overcome. This underscores the critical need for concurrent investment in physical and digital infrastructure as a prerequisite for sustainable e-CHIS use.

Further research should employ longitudinal mixed-methods designs to examine the long-term relationship between training interventions and system utilization. Comparative studies across different implementation models could identify optimal approaches for balancing training quality with coverage in resource-limited settings. Research examining the specific mechanisms through which infrastructure constraints moderate technology acceptance relationships would substantially advance both theory and practice in digital health implementation.

5. Unique contribution to Practice, Policy and theory

For practice, the findings emphasize the need for continuous, context-sensitive training approaches rather than one-time training events. Implementation strategies must address both immediate user challenges and underlying systemic barriers through decentralized support systems and infrastructure investments. The substantial sub-county variations observed underscore the importance of localized implementation approaches rather than standardized one-size-fits-all strategies.

Future policy efforts should focus on developing sustainable models that balance technical innovation with contextual realities to ensure the long-term success of digital health transformations.

The theoretical contribution of this work lies in its validation and necessary refinement of the Technology Acceptance Model for resource-limited settings. While confirming core TAM relationships, the study reveals important boundary conditions where infrastructure constraints and support system variations significantly moderate the relationship between training interventions and technology acceptance. This insight extends the model's application to similar low-resource contexts pursuing digital health transformation.

6. Conclusion

This study provides a comprehensive assessment of training gaps and support needs for Electronic Community Health Information Systems (e-CHIS) implementation in Migori County, Kenya. The findings demonstrate that while significant progress has been achieved in training coverage, substantial challenges persist in training quality, technical support systems, and infrastructure limitations that collectively impact technology acceptance and system utilization.

The research successfully identified critical gaps that require immediate intervention: the disconnect between training coverage and quality assurance, persistent technical challenges affecting 85.2% of providers despite training, significant disparities in technical support access between sub-counties, and the unexpected decoupling of technical skills from perceived usefulness. These findings justify a fundamental reorientation of e-CHIS implementation strategy from a focus on training quantity toward a more holistic approach that integrates quality training with robust support systems and infrastructure improvements.

The study's implications extend beyond Migori County to similar resource-limited settings implementing digital health technologies. By addressing the identified training gaps and support needs through integrated, multi-level interventions, digital health initiatives can enhance system acceptance, improve utilization rates, and ultimately contribute to achieving the broader goals of universal health coverage and improved health outcomes in underserved communities.

6.1. Limitations and Future Research

Despite several findings being presented in this study, it must also be noted that there are some limitations. The first limitation to consider is that because of the cross-sectional design of the study, we cannot determine any causal relationships because it only looks at people's perceptions of e-CHIS during one period, and we cannot determine how training or support would create long-term use of e-CHIS. The second limitation is that self-reported measures of perception and skill may be biased due to the potential for social desirability, despite providing anonymity to respondents. Lastly, since only two sub-counties in one county were involved in collecting the data, we cannot be confident that the results will be applicable to other counties and/or regions, especially counties and/or regions that may have very different health system environments.

The aforementioned limitations point to possible areas of future study. For example, longitudinal studies should be done to track the development of both technology acceptance and skill retention over time. Additionally, it would be beneficial to perform comparative analyses of multiple counties or countries to identify both contextual and universal factors that may contribute to the success of implementing an e-CHIS. Lastly, it is necessary to conduct studies based on principles of implementation science to develop and test comprehensive intervention packages that include targeted training, intensive on-site support and improved infrastructure to determine the best methods for bridging the gap between training and usage of e-CHIS in low-resource settings.

Ethical Considerations

The study protocol was reviewed and approved by the National Commission for Science, Technology and Innovation of Kenya (NASCOSTI/P/25/4175747), Ethical approval was obtained from the Maseno University Ethics Review Committee (Reference: [MSU/DRPI/MUERC/01550/25]) and permission was sought and granted by the County Government of Migori, as well as Nyatike and Awendo Sub Counties managers. Participants provided informed consent, with measures ensuring confidentiality, anonymity, and voluntary participation per the Declaration of Helsinki.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions

- Author A: Conceptualized study, conducted literature review, designed study methodology, collected data, analysed results and developed the manuscript.
- Author B: participated in analysed results, reviewed and revised manuscript. Offered expertise on research protocols, contributed to discussion on training gaps and support need. All authors approved the final manuscript.
- Author C: Offered expertise on research protocols and reviewed and revised the manuscript

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Conflict of Interest Statement

I hereby declare that I have no conflict of interest regarding the publication of the article titled: “assess the training gaps and support needs that influence e-CHIS adoption in Migori County, Kenya using TAM Framework”

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