Texila International Journal of Public Health
ISSN: 2520-3134
DOI: 10.21522/TIJPH.2013.11.02.Art025

Integration of Telehealth Systems into HIV Care Services in Sub-Saharan Africa: A Scoping Review

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Abstract

Telehealth programs have been documented to help conserve scarce resources and enable the provision of quality and convenient patient care. Given the high HIV prevalence in sub-Saharan Africa, it is crucial for telehealth programs to be implemented. The purpose of this scoping review is to map the literature on telehealth in HIV care in sub-Saharan Africa, determine gaps in the utilisation of telehealth, and identify the barriers to implementation. A keyword search for studies reporting on telehealth in HIV care from PubMed, Research gate and gray literature was conducted, and studies published from 2015 to 2022, meeting the research criteria were included in the scoping review. Thematic content analysis was used to analyze findings from the included articles. Extraction of themes was performed using NVIVO version 12. Quality appraisal of the included studies was conducted using the mixed methods appraisal tool 2018 version. Database search retrieved 395 potentially eligible articles. Of these, 13 studies reported evidence of telehealth in HIV care. Included studies were conducted in South Africa, Kenya, Zambia, Zimbabwe, Togo, Mozambique, Tanzania, and Uganda. Three main themes emerged from the thematic content analysis: telehealth systems in sub-Saharan Africa are still at pilot stages or not widely implemented; users accept telehealth but raise concerns about privacy; and that low mobile phones ownership hampers telehealth implementation. The review revealed evidence for the effectiveness of telehealth in HIV care despite the presence of barriers. In this sense, it is recommended to adopt telehealth, which is cost effective, and improves access to healthcare.

Keywords*: HIV; Sub-Saharan Africa; Telehealth; Utilisation.*

Introduction

Emerging diseases such as the coronavirus disease (COVID-19), and poor healthcare systems have impacted the provision of services in developing countries particularly in human immunodeficiency virus (HIV) care [1-3]. HIV care interruptions leading to treatment defaulting significantly affect people living with HIV (PLHIV) who require antiretroviral treatment (ART) and viral load testing. Key populations at risk of acquiring HIV such as sex workers, and men having sex with men (MSM) are particularly affected by interruptions in HIV services. Fragmented HIV care services create challenges that can promote HIV transmission as intermittent HIV prevention and testing services are offered [4].

Telehealth was recommended to ensure continuous HIV care during pandemics, and for effective service provision in limited resource settings [5-8]. Telehealth entails "the delivery and facilitation of health and health-related services including medical care, provider and patient education, health information services,

Received: 04.04.2023 ***Accepted: 20.04.2023*** ***Published on: 30.06.2023***
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and self-care via telecommunications and digital communication technologies" [9]. Telehealth enables virtual consultations, helps conserve scarce resources on both the service provider and patient, and enables the provision of quality and convenient patient care through electronic follow-up visits [6].

Telehealth uptake has been slow in Africa despite lessons learnt during the COVID-19 pandemic [10]. Several challenges that hamper telehealth uptake such as poor internet connectivity and absence of commercial telehealth players have been reported [11], and understanding these challenges is key to informing strategies for ideal and high-quality telehealth services for HIV care. It is worth noting that successful telehealth services have been reported in HIV prevention and care services for sexual and gender populations in Rhodes Island [12], and pre-exposure prophylaxis (PrEP) and HIV home testing in Brazil [13] providing lessons for future telehealth implementers on overcoming the barriers and challenges.

Studies done in sub-Saharan Africa (SSA) highlight the benefits of adopting telehealth in HIV services delivery [10]. The sub-Saharan region is the world's epicentre of HIV accounting for more than 70% of the global burden of the infection [14]. In addition, access to HIV care is generally poor in SSA and worse in rural areas due to limited healthcare centers [15]. Thus, this study sought to map the literature on telehealth in HIV care in SSA, determine gaps in the utilisation of telehealth, and identify the barriers to integration of telehealth into HIV care.

Methods

Study Design

A scoping review method was selected as the most appropriate method to address the research question: "What is the status of telehealth utilisation in HIV care in sub-Saharan Africa?". The review was guided by the Arksey and O'Malley [16] framework which suggests identification of the research question, identification of relevant studies, study selection, charting the data, and collating, summarizing, and reporting of the results. Appraisal of the included studies was performed using the Mixed Method Appraisal tool (MMAT) version 2018. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines guided the reporting of the review results.

Search Strategy

The scoping review was conducted by systematically searching, selecting, and synthesizing existing knowledge from PubMed and Researchgate. The search involved articles of all study designs except reviews. Additionally, editorials, commentaries and gray literature from university dissertations and theses, institutional repositories, and government and international organisations' reports were also searched. The search terms used included "telehealth", "HIV" and "sub-Saharan Africa". Boolean terms, "and" and "or", were used to separate the search terms. Furthermore, reference lists of studies meeting the inclusion criteria were searched for relevant studies.

Screening of the retrieved articles following database search was conducted in 3 stages. First, the principal researcher screened titles of the articles. Second, two co-researchers screened abstracts and full articles in parallel. Discrepancies in reviewers' responses at full article screening stage were resolved by the principal researcher. Kappa statistics was employed to assess the level of agreement between the two co-researchers at each stage.

Eligibility for Research Question

The eligibility of the research question for the scoping review was determined by the Population, Concept, and Context (PCC) framework as shown in Table 1.

Table 1. Framework for Determining Eligibility of the Research Question

Population	**N/A**
Concept	Telehealth services used to manage HIV
Context	sub-Saharan Africa

Eligibility Criteria and Study Selection

This study used an eligibility criteria to select relevant studies on telehealth utilisation in HIV care in SSA.

Inclusion Criteria

1. Articles reporting on telehealth in HIV care in SSA.
2. Articles reporting on healthcare staff perceptions and organisational level factors influencing implementation and scaling of telehealth in SSA.
3. Articles published in English between January 2015 and July 2022.

Exclusion Criteria

1. Articles reporting on telehealth services outside SSA.
2. Articles published before January 2015 and after July 2022.

Charting of Data

A standardised data extraction sheet was used to extract data on the following: author and year of publication, location, aim, study design, study population and type of telehealth service.

Collating, Summarizing and Reporting of the Results

Thematic content analysis was used in this review to analyze findings from the included articles. Extraction of themes from the articles was performed using NVIVO version 12. Two reviewers analysed the data.

Quality Appraisal of Included Primary Studies

The MMAT version 2018 was used to assess the quality of the included articles. Two reviewers independently performed the appraisal process, including calculating the percentage quality score. A score of $\leq 50\%$, was regarded as low quality; 51–75%, was average quality; and 76–100%, was high quality.

Results

Screening Results

Following database search, 395 potentially eligible articles were retrieved. Of the 395 articles, 63 were eligible for inclusion in abstract screening. One duplicate was removed leaving the total number of articles eligible for abstract screening at 62. Following abstract screening, 31 articles were excluded leaving 31 articles for full articles review. Further 18 articles were excluded after full articles review and 13 articles were included in this study. The agreement between the two co-researchers was fair with the following results: kappa statistic = 0.172, p-value = 0.61. Figure 1 shows a flow diagram of the screening results.

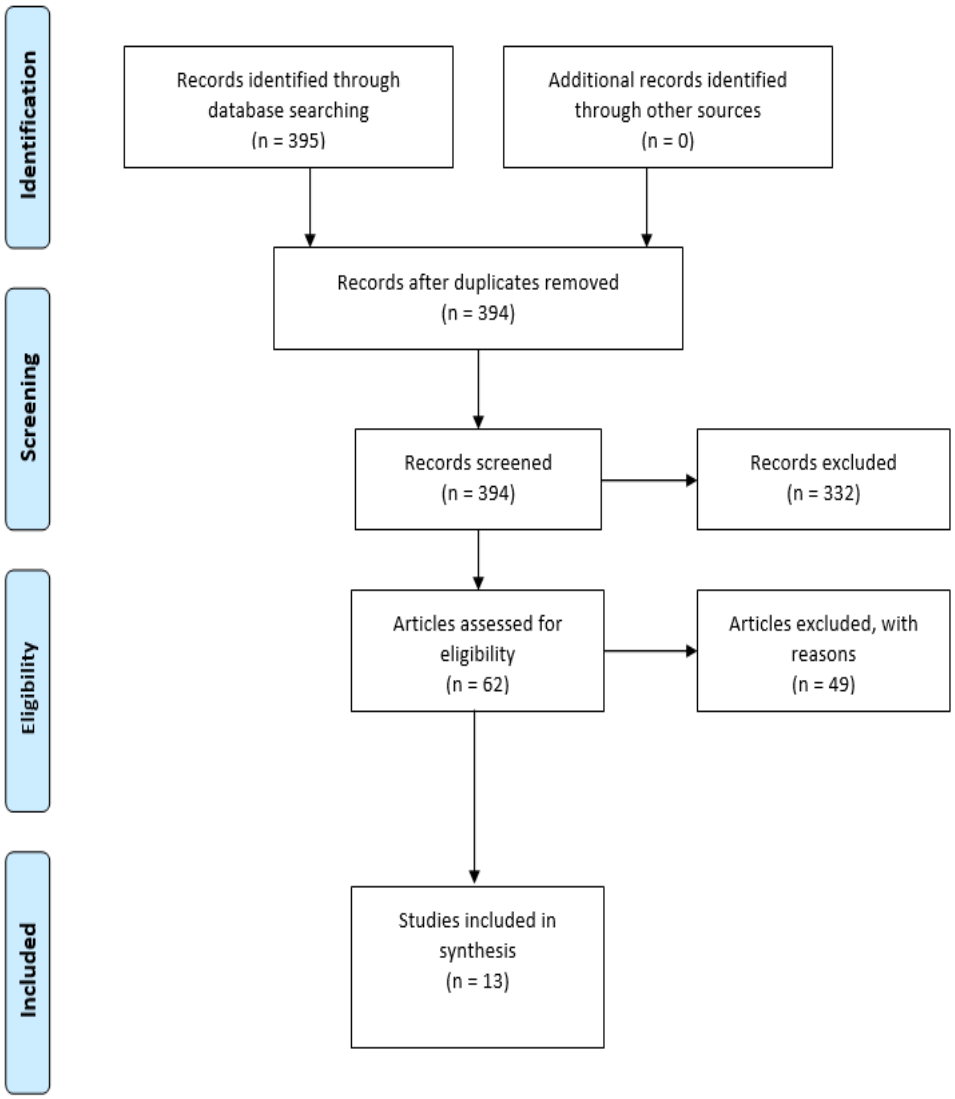

Figure 1. Flow Diagram of Screening Results

Characteristics of Included Studies

The characteristics of included studies are shown in Table 2. Of these studies, 4 were conducted in South Africa, 3 in Kenya, 1 in Zambia, 1 in Zimbabwe, 1 in Togo, 1 in Mozambique, 1 in Tanzania and 1 in Uganda.

All the included studies reported on integrating telehealth into HIV care and were published between 2015 and 2022. Study designs for the included studies were as follows: 7 cross sectional, 4 randomised controlled trials, 1 quasi-experimental, and 1 pre-post-test. No gray literature was included in this scoping review.

Table 2. Characteristics of Included Studies

Author (Date)	Location	Aim	Study Design	Study population	Sample Size	Methodology/ Methods	Type of Telehealth Service	Outcome
Kurth et al. (2019)	Kenya	To assess the feasibility of computer-based counseling to promote HIV prevention and offer HIV services	Randomised controlled trial	People living with HIV	236	Observations	Web-based counseling program	A computer-based counseling tool was considered feasible and acceptable in a high-volume HIV setting. The counseling tool provided evidence-based ART adherence and risk reduction support.
Sarna et al. (2019)	Kenya	To evaluate the effectiveness of a cell phone counseling intervention to promote retention in care and HIV testing of infants among women with HIV	Randomised controlled trial	Pregnant women with HIV	404	Observations	mHealth*	The one-on-one counseling sessions offered via cell phones were effective in retaining mothers with HIV infection in care. The sessions also promoted uptake of infant HIV testing and antenatal and postnatal care services.
Venables et al. (2019)	Zimbabwe	To explore the experience of using SMS to send information about the availability of VL results to patients in rural areas and explore patient and health-care worker perceptions of the intervention.	Cross sectional	Patient and health-care workers	32 Patients and 5 Healthcare workers	Interviews and focus group discussions	mHealth	The HIV viral load SMS intervention was acceptable to both patients and health-care workers. The intervention was perceived to improve ART adherence and improve patient management. Participants however highlighted the challenges in understanding the language of the messages resulting in patients visiting their health facility unnecessarily. Another concern noted was about unintentional HIV disclosure relating to the content of the messages or phone-sharing.
Gbeasor-Komlanvi et al. (2020)	Togo	To describe the acceptability and factors associated with	Cross sectional	People living with HIV	259	Questionnaire	mHealth	Factors associated with acceptability of receiving SMS were age and education. People living with HIV were receptive to

		the use of mobile telephones in the care of people living with HIV						the integration of mobile technology into HIV management.
DiAndreth et al. (2020)	South Africa	To identify perceived benefits, concerns, and suggestions for a future mHealth program to deliver HIV Viral Load and CD4 count test results directly to patients via mobile phone.	Cross sectional	Patients and healthcare providers	11 patients and 28 healthcare providers	Interviews	mHealth	Telehealth service reduced workload for healthcare providers, reduced waiting period for patients, and empowered patients. Concerns such as privacy and patients' inability to interpret results were noted. In addition, patients were not comfortable with receiving distressing results through text messages. There was a consensus that mHealth should complement face-to-face interactions, and educational information to interpret results is key.
Campbell et al. (2021)	South Africa	To characterise the use of mobile devices to tailor mHealth interventions for people living with HIV and at risk for acquiring HIV.	Cross sectional	People living with HIV and at risk for acquiring HIV	788	Interviews	mHealth	Only 10% of the respondents used cellphones to seek health information. However, nearly all the phone owners showed willingness to receive healthcare messages.
Madhvani et al. (2015)	South Africa	To identify patient demographic groups least likely to use mobile phones as reminder tools in HIV care	Cross sectional	People living with HIV	883	Questionnaire	mHealth	The study highlighted that patients aged 45 years or above, women, and patients with only primary education were associated with being less likely to use mobile phones as clinic appointment reminders. Patients aged 35 years or above, and patients with a lower monthly income were associated with being less likely to use mobile phones as medication reminders

Nhavoto, Grönlund & Klein (2017)	Mozambique	To determine patients' and healthcare workers' views on an mHealth intervention aiming to support retention in ART and Tuberculosis treatment	Randomised controlled trial	People living with HIV, and healthcare workers	141 patients and 40 healthcare workers	Interviews	mHealth	Study participants found the SMS system to be useful and reliable. Highlighted positive effects of the system included reduction in the number of failures to collect medication and fewer missed appointments. Patients showed confidence in the system. The system was perceived to improve communication between healthcare workers and patients. The system further assisted in education. Most of the participants would recommend the system to other patients or healthcare centres. However, healthcare workers highlighted the risks of unintentional disclosure of health status in cases where patients use shared phones
Mbotwa (2022)[7]	Tanzania	To identifying the extent of and predictors for use of a smartphone based mHealth application among female sex workers	Quasi-experimental	Female sex workers	470	Interviews	mHealth	The optimal use of the mHealth application was significantly higher among women who were older, who had at least secondary education, who had social support, who had high awareness of PrEP, and who had experience using social media applications.
Siedner, Santorino, Haberer & Bangsberg (2015)	Uganda	(1) To identify predictors of uptake of a mHealth application for a low-literacy population of people living with HIV. (2) To evaluate the efficacy of various SMS to optimise the balance between confidentiality and accessibility.	Randomised controlled trial	People living with HIV	385	Observation	mHealth	Nearly two thirds of the participants successfully received a message with a viral load result. Nearly 90% of the participants correctly identified the message format, and 60% returned to the clinic at the requested time. The strongest predictors of reported message receipt were the ability to read a complete sentence and a demonstrated ability to access a text message on enrollment. Participants who could read a complete sentence were more likely to identify the

								message format and return to clinic. Participants who were sent a PIN-protected message were less likely to identify the message or return to the clinic. Age, gender, and socioeconomic characteristics did not predict any outcomes.
Mogoba et al. (2019)	South Africa	To explore acceptability and feasibility of mHealth interventions	Cross sectional	Recently postpartum women living with HIV	27	Focus group discussions	mHealth	Nearly all the respondents were familiar with MomConnect, the national mHealth text support service in South Africa. Most of the respondents described the mHealth text support service positively. Respondents expressed interest in future HIV mHealth applications.
Ivanova et al. (2021)	Kenya	To evaluate the usability and effectiveness of the pilot digital peer support platform - ELIMIKA	Pre-post-test design	HIV-positive youths	90	Questionnaire	Web-based platform.	Nearly all the participants were satisfied with the web based platform. Over 95 % of the participants stated that they would use it again. There was no change in knowledge and behavior of participants. However, adherence intentions after the intervention improved.
Sutcliffe et al. (2017)	Zambia	To determine the feasibility of using mobile phones to decrease the turnaround time for early infant HIV diagnosis	Cross sectional	Mothers of HIV positive infants	419	Interviews	mHealth	Mobile phone and text messaging improved early infant diagnosis. However, challenges such as low mobile phone ownership, and coverage in rural areas affect implementation.

*mHealth: mobile health

Quality Assessment of Included Primary Studies

All 13 included studies underwent quality assessment guided by the MMAT version 2018. Average scores are shown in supplementary 1. One study scored 85.7% while 12 scored 100%.

Study Findings

Following thematic content analysis of the 13 included studies, it emerged that (i) most telehealth systems for HIV care in SSA are still at pilot stages; (ii) users accept telehealth but raise concerns about privacy; and (iii) low mobile phones ownership potentially hampers telehealth implementation.

Telehealth Systems are Still at Pilot Stages or not Widely Implemented

All 13 articles included in this review were based on telehealth services still at pilot stages. Of these, 11 articles were based on mHealth intervention using short message service (SMS) [18-21, 23-24, 26, 29] and mobile applications [22, 25, 27], while 2 articles [17, 28] involved web-based telehealth platforms. This scoping review could not identify studies reporting on full-scale implemented telehealth services in HIV care in SSA.

Users Accept Telehealth but Raise Concerns about Privacy

Eight articles [17, 19-22, 24, 27, 28] investigating feasibility of telehealth in HIV care all reported that users accept telehealth. The articles indicated improved ART adherence and overall patient management. Age and level of education were predictors of telehealth acceptance.

However, both patients and service providers highlighted concerns about privacy. There is a risk of unintentional disclosure of health status in cases where patients use shared phones. There is also a risk of data breach given that no proper measures or infrastructure have been instituted to protect sensitive patients' data.

Low Mobile Phones Ownership Hampers Telehealth Implementation

Smartphone ownership was cited as a hindrance to mobile application telehealth implementation especially in rural areas [22, 23, 29]. One study conducted in South Africa reported that smartphone ownership was only 10% among the participants [22]. However, the use of SMS improved coverage as people with low monthly incomes used feature phones.

Discussion

This study mapped available literature on the status of telehealth utilisation in HIV care in SSA. Despite the need, the findings revealed a gap in the integration of telehealth into HIV care. Low phone ownership and coverage especially in rural areas hinder the implementation of telehealth but PLHIV accepts the technological intervention.

The findings of this review reveal the absence of effective telehealth systems in SSA. This is despite the HIV burden in the region and calls to adopt telehealth in HIV care [5-8]. Similar studies in developed countries have highlighted the cost of implementing telehealth and lack of reimbursement as the main causes of poor implementation [30, 31]. Scott and Mars [32] revealed that globally, telehealth is still not yet fully integrated into the health care systems, and closing this gap requires coordinated political and professional will. In SSA, some studies have revealed that poor knowledge about telehealth makes the technologies unpopular among Africans. [33, 34]. This scoping review showed acceptance by end users to telehealth in HIV care. A systematic review conducted by [35] revealed apathy as one of the least barriers to telehealth uptake. However, in their systematic review, age and level of education contributed significantly to acceptance, as identified in this scoping review. The younger population tends to accept and understand telehealth more, as compared to the older generation. Confidentiality and privacy issues, as highlighted in this scoping review, also emerged

as barriers in the study by [35]. Unsecured networks in developing countries as well as unencrypted hardware can result in issues around breach of personal health information, and this increases resistance to adoption.

The findings of this study further pointed out low phone coverage as another barrier to utilisation of telehealth in HIV care. This is in tandem with findings by Mothobi & Grzybowski [36], who observed that despite the advancements in technology in the past decade, mobile phone ownership is still low in some African countries especially in rural areas. Mobile network coverage is even significantly poor in African countries such as Mali with 20%, Burundi with 30% and Cameroon with 58% as of 2016 [37].

Poor mobile and network coverage greatly hamper telehealth uptake as the technologies mainly make use of cellphones to send information.

Strengths and Limitations to this Scoping Review

This scoping review adds to a body of knowledge of telehealth in HIV care in SSA. The review was guided by PRISMA which is an international standard for the organization and reporting of reviews. In addition, article search was limited to two trusted research databases and multiple reviewers were involved in determining studies meeting the inclusion criteria.

The main limitation of this scoping review is that only a period of seven years was examined. Human judgement could have also influenced the selection of articles for this review. However, the use of multiple reviewers limit this bias.

Recommendations for Further Research

Further research is recommended that include articles published outside the 7 year period of this scoping review. Important developments could have been missed in articles published before the year 2015.

Conclusions

Integration of telehealth in HIV care is a crucial tool to increase access to healthcare through eliminating barriers such as discrimination. However, full implementation of telehealth is lagging in SSA despite the region being worst affected by the HIV pandemic. This is even though end users accept telehealth as an effective alternative to the traditional face-to-face practice. This scoping review provides direction for public policy to intervene and act on reducing some of the indicated barriers such as low mobile phones ownership.

Conflict of Interest

The authors wish to declare no conflict of interest in this manuscript.

Acknowledgements

We gratefully acknowledge the support of the data collectors.

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