

Review article

Information and communication technologies for adherence to antiretroviral treatment in adults with HIV/AIDS



Ivana Cristina Vieira de Lima^{a,*}, Marli Teresinha Gimenez Galvão^b,
Herta de Oliveira Alexandre^a, Francisca Elisângela Teixeira Lima^b,
Thelma Leite de Araújo^b

^a Federal University of Ceará (UFC), Fortaleza, CE, Brazil

^b Federal University of Ceará (UFC), Nursing Department, Fortaleza, CE, Brazil

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ABSTRACT

Introduction: Information and communication technologies support interventions directed at the prevention of HIV transmission and patient monitoring by promoting improved accessibility and quality of care.

Objective: To evaluate the efficacy of information and communication technologies in the adherence to antiretroviral treatment in adults with HIV/AIDS.

Methodology: Systematic review conducted from March to May of 2015 in three databases—the Cumulative Index to Nursing and Allied Health Literature (CINAHL); the Latin-American and Caribbean Literature in Health Sciences (LILACS/BIREME) and SCOPUS; and the Cochrane library and the Medical Literature Analysis and Retrieval System Online portal (MEDLINE/PubMed). The sample consisted of nine randomized clinical trials based on the use of information and communication technologies for adherence to antiretroviral treatment in adults with HIV/AIDS.

Results: Three studies analysed the use of a short message service – SMS – two phone calls, two alarm devices, one web-enabled Hand-held device and one web electronic intervention. Improvements in the levels of adherence in the group subjected to the intervention were identified in seven studies. The phone was the type of information and communication technology with proven efficacy with respect to adherence. It was used to make calls, as well as to send alert messages and reminders about taking medications. Pagers were not considered to be effective regarding adherence to antiretroviral therapy.

Conclusion: The integrated use of information and communication technologies with standard care promotes increased access to care, strengthening the relationship between patients and health services, with the possibility of mitigating the difficulties experienced by people with HIV in achieving optimal levels of adherence to drug therapy.

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1. Introduction

Information and communication technologies (ICTs) include any communication devices, including radio, television, cell phones, computers, network equipment (hardware), programs (software) and satellite systems, as well as the various services and

applications for which they are used, such as video conferencing, online chatting and distance learning [1].

In health care, the use of ICT goes beyond the transmission of information as it supports self-care, behavioural changes, information exchanges among peers and emotional support, as well as providing benefits in tracking people with chronic diseases [2,3]. In the context of HIV/AIDS, ICTs have mediated interventions directed at preventing the transmission of the virus or monitoring patients by promoting improved accessibility and quality of care [4].

The influence of the advancements in the treatment of HIV/AIDS in the transition from acute to chronic disease is highlighted. Antiretroviral therapy (ART) has improved health, reduced opportunistic infections, and increased survival and improved quality of life in approximately 9.7 million people worldwide [5,6].

* Correspondence to: Tipógrafo Sales St., 992, Amadeu Furtado, 60455-500 Fortaleza, CE, Brazil.

E-mail addresses: doutorandaivana@gmail.com (I.C.V.d. Lima), marligalvao@gmail.com (M.T.G. Galvão), oliveiraherta@gmail.com (H.d.O. Alexandre), felisangela@yahoo.com.br (F.E.T. Lima), thelmaaraujo2003@yahoo.com.br (T.L.d. Araújo).

Despite these benefits, the long-term use of ART implies challenges. The main difficulty faced by persons living with HIV is adherence (represented by ingesting at least 95% of tablets) due to the large numbers of pills and side effects and the high frequency of doses and/or tablets taken per day [7,8].

Failure of treatment adherence elicits individual (decreased CD4 T cells, viral resistance, risk behaviour, progression to AIDS and death) and collective losses (increased transmission of HIV and other sexually transmitted infections, higher treatment costs and hospitalizations) [6,9]. For these reasons, care tools aimed at continuous monitoring and counselling, as well as strategies for patient orientation/training, with a focus on achieving optimal levels of adherence to ART, are needed [5].

A theoretical review presented considerations regarding the use of information technology in the context of HIV, highlighting the possibility of a positive impact on the levels of satisfaction and patient safety, in addition to improvements in adherence to ART and care quality indicators. Moreover, the use of the Internet, digital media, information systems/monitoring and telephone provides information for the diagnosis and treatment of HIV, as well as opportunities for the electronic registration of data and increased access to information for both the patient and the multidisciplinary team [4].

A systematic review analysed 23 publications and 32 ongoing projects on the use of the telephone, Internet and social media in health care in the context of HIV treatment. There was emphasis on the use of technology in the following situations: primary prevention of HIV transmission, promotion of HIV testing, establishment of bonds and conservation care, support for starting ART, and promoting adherence to ART, as well as achieving increased viral suppression and preventing secondary infections. Although increasing attention has been devoted to the use of technology, it is necessary that other studies also analyse the efficacy of these care tools [10]. The term efficacy entails that an intervention produces the expected result under ideal circumstances [11].

Furthermore, reviews have considered the possibilities of the use of ICTs in the context of HIV/AIDS, but no systematic reviews about the efficacy of these technologies in treatment adherence in adults with HIV have been found. Therefore, the following research question was asked: “What is the efficacy of information and communication technologies in supporting HIV/AIDS antiretroviral treatment adherence in adults?” In this review, we considered the types of ICT that are mainly used to monitor people with HIV: computers, phones, software and pagers.

Analysis of the efficacy of ICT as a health care instrument can identify alternatives to supportive care for people living with HIV/AIDS, as well as the benefits and limitations of these alternatives. Analysis also highlights the possibility of sharing with practitioners and researchers the theoretical and practical assumptions for the replication of information and communication technologies with proven efficacy with respect to the adherence to antiretroviral treatment in adults with HIV/AIDS.

This study aimed to evaluate the efficacy of information and communication technologies with respect to adherence to antiretroviral treatment in adults with HIV/AIDS.

2. Methods

A systematic review was conducted according to the recommendations of the Cochrane Handbook for Systematic Reviews of Interventions [12]. A systematic review is a type of secondary study that enables the development of clinical guidelines for decision-making and facilitates the planning of clinical research in health care [13].

The research question was designed based on the PICO strategy, which stands for Patient (adults living with HIV), Intervention (using ICT) Comparison (standard care) and Outcomes (treatment) [14].

We performed intentional sampling from clinical trials based on the use of ICT for adherence to antiretroviral treatment by adults with HIV/AIDS, regardless of the publication year and language. We excluded repeat publications; those that did not answer the research question; case reports, experience reports and theoretical, qualitative or cross-sectional studies; review papers and clinical trial protocols, as well as clinical trials that have addressed the use of information and communication technologies in HIV prevention and rapid testing.

The electronic search was carried out by two reviewers simultaneously in three databases – the Cumulative Index to Nursing and Allied Health Literature (CINAHL); the Latin-American and Caribbean Literature in Health Sciences (LILACS/BIREME) and SCOPUS; and the Cochrane library and the Medical Literature Analysis and Retrieval System Online portal (MEDLINE/PubMed), accessed through the Portal CAPES (Higher Education Personnel Improvement Coordination).

The following controlled descriptors available in MeSH (Medical Subject Headings): Technology; HIV; Internet; Cell Phones; Software; Telemedicine; eHealth; Remote Sensing Technology; Clinical Trial were used. The crosses performed were [HIV and Technology], [Internet and HIV and Technology], [HIV and Technology and Cell Phone], [HIV and Technology and Software], [HIV and Nursing and Technology], [HIV and Telemedicine], [HIV and eHealth], and [Remote Sensing Technology and HIV]. The controlled descriptor Clinical Trial was included in all crosses.

After the search was completed on May 22, 2015, the articles were analysed by two authors, who read the titles and abstracts. Eligible studies were translated into the native language of the authors (Portuguese) and read in full.

Two reviewers assessed the quality of the clinical trials and the data independently. In case of doubt, there were meetings between the reviewers to reach consensus. To analyse the scope of the studies, the reviewers used a reference list.

From the crosses that were carried out, a total of 2517 studies were found in the investigated databases. From these studies, 91 replicates were removed. Analyses of the titles and abstracts yielded 65 pre-selected studies; however, 59 studies were excluded because they were not clinical trials, as described below: four case reports, five experience reports, 13 theoretical studies, nine qualitative studies, nine cross-sectional studies, four quasi-experimental studies, 12 review papers and three clinical trial protocols. Among the six selected articles, three were found in MEDLINE/PubMed, three were found in SCOPUS, and three were found using reverse search. Ultimately, the sample consisted of nine studies (Fig. 1).

Analysis of the quality of the studies was based on a quality scale described by Jadad et al. [15], in which the score ranges from 0 to 5 and is calculated from the following parameters: (1a) The study was random (using words such as ‘random’, “randomization”)?; (1b) The method was appropriate?; (2a) The study was double blinded? (2b) The method was appropriate?; and (3) There were descriptions of losses and exclusions?

The studies were also analysed for allocation confidentiality and were classified as Category A—the allocation confidentiality process was adequate; Category B—the allocation confidentiality was not described, but it was stated in the text that the study was random; Category C—the allocation confidentiality was inadequate; and Category D—the study was not random [12].

Analysis of the studies was performed using a pre-defined instrument with the following information: author, year, country where the study was conducted, objective, proposed technology, number of participants, methods and results.

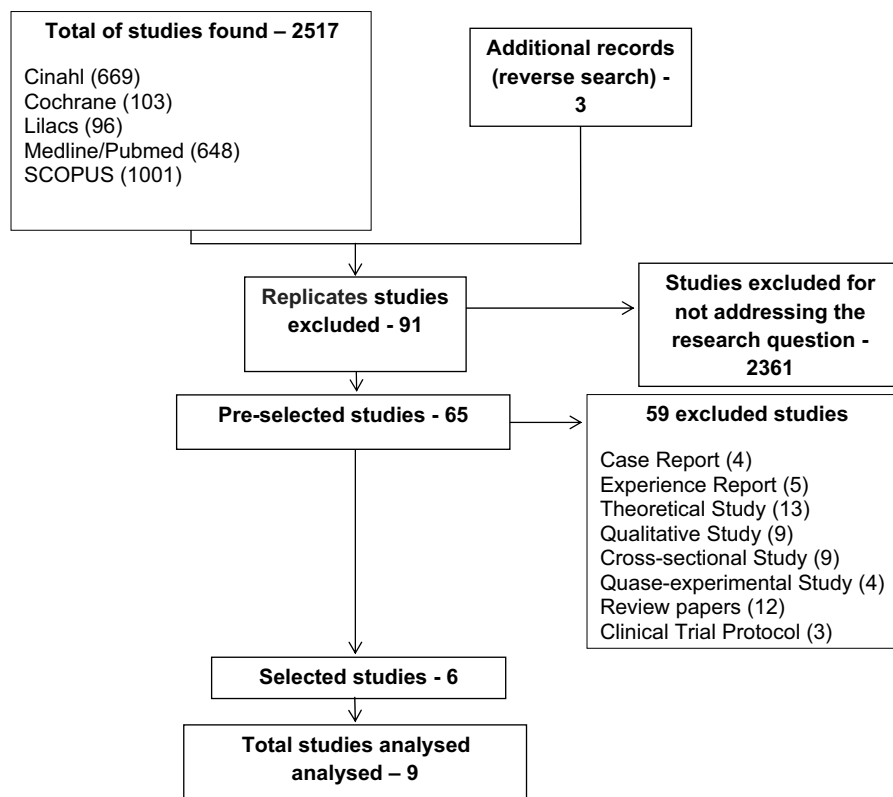


Fig. 1. Flowchart of the identification, selection and inclusion of studies.

For the ethical questions, the integrity of the articles and the copyright were respected, with no modification of the content in favour of this research.

3. Results

Table 1 characterizes the studies based on the author, country, proposed technology, sample, clinical trial, improvements in adherence, Jadad scale score and allocation confidentiality.

The years of the studies' publication were from 2008 to 2015. All studies were randomized and included a total of 1866 adults with HIV using ART who were recruited from outpatient clinics [16–21] and hospitals [22–24]. Regarding location, most of the studies were developed in the United States of America (USA) [16,19,20–23] and in African countries such as Kenya [15,16,18] and Cameroon [22] (Table 1).

The proposed technologies were short message services—SMSs [18,22,23,24], phone calls [16,19], pagers [17,23], web-enabled hand-held device plus personal health record [20] and web electronic intervention [21]. The subjects' times of follow-up ranged from 4 (1 month) to 72 weeks (18 months). Improvements in adherence levels in the group subjected to the intervention based on the use of technology were identified in seven studies [16,18–23] (Table 1).

Regarding the type of communication, in two studies, telephone calls were synchronously used [16,19]; in five studies, the feedback was asynchronous from the subject after receiving an SMS [22–24], web-enabled Hand-held device [20] and web electronic intervention [21]. In two studies, the subjects received asynchronous pager messages, web electronic intervention and SMS without providing feedback [17,18]. The quality of the evaluation of the studies showed good methodological quality, with a predominant score of 3 [17,18,23,24]. Regarding allocation confidentiality, there was an emphasis placed on Category A—the allocation confidentiality was

adequate, except for two studies, whose allocation confidentiality has been previously described [16,18] (Table 1).

Table 2 provides information on the use of technology and the measurement of adherence.

Regarding the use of information and communication technologies, there was a predominance of the combination of the above technologies with standard care, which included patient education [16,20], counselling sessions for ART use [17,21] and follow-up visits [18–20,22,23]. In one study, technology was also used in isolation [30]. In another study, technology was used both in isolation and in combination with other therapies [17] (Table 2).

Regarding the frequency of offering information technology, the daily rate was predominant [17,19]. One study used a monthly frequency [16], one study used a weekly frequency [24], and another study compared the daily and weekly use of technology [18]. Regarding the professionals who implemented the technology, different health professionals were noted, including nurses, pharmacists and doctors [16–23] or qualified professionals from other areas [18,19,24] (Table 2).

Regarding the methods of ART adherence measurement and self-reported adherence [16,22–24], the use of other measures, such as adherence self-efficacy [20,21], pill counts [17,21], drug monitoring systems [17,19], visual analogue scales [19,24] and pharmacy records on replenishment [24] was also noted. The combination of different forms of adherence measurement was observed in two clinical trials [23,24]. Additionally, multiple adherence measures during the study period were highlighted, from the beginning of the follow-up period to the 72nd week (Table 2).

4. Discussion

One limitation of this review is the difficulty to analyse and compare studies due to their variability that do not allow for summary measures of meta-analysis calculations, such as: different measure-

Table 1
Study characterizations.

Authors, Year, Country	Technologies proposed	Sample	Type of clinical trial	Time of follow-up	Results	Jadad scale/Allocation confidentiality
Reynolds et al. (2008), USA	Phone call	109 IG ^a : 54 CG ^b : 55	Classic	64 weeks/16 months	Adherence rate in the IG 99.7% (p = 0.023) and in the CG 97.3% (p = 0.019)	2/B
Lester et al. (2010), Kenya	SMS ^c	538 ^a IG: 273 ^b CG: 265	Classic	48 weeks/12 months	Self-reported adherence by 168 of the 273 IG, compared with 132 of the 265 in the CG (RR ^d to nonadherence = 0.81; 95%; CI ^e = 0.69–0.94; p = 0.006)	2/A
Chung et al. (2011), Kenya	Alarm device × Counselling	400 ^a IG: 300 ^b CG: 100	Factorial	72 weeks/18 months	No significant impact of the alarm device usage in adherence (HR ^f = 0.93; 95%; CI = 0.65–1.32; p = 0.7)	3/A
Pop-Eleches et al. (2011), Kenya	SMS daily × SMS monthly	431 ^a IG: 302 ^b CG: 139	Classic	48 weeks/12 months	90% of IG adherence compared with 40% of CG adherence (p = 0.03)	3/B
Hardy et al. (2011), USA	SMS × Alarm device	22 ^a IG: 12 ^b CG: 11	Classic	6 weeks/1.5 months	Self-reported adherence in IG 92.6% (CI = 77.5–107.7) and in CG 72.4% (CI = 56.5–88.3)	3/A
Mbugabaw et al. (2012), Cameroon	SMS	200 ^a IG: 101 ^b CG: 99	Classic	24 weeks/6 months	No significant effect of the intervention on adherence measured by the visual analogue scale (RR = 1.06; 95%; CI = 0.89, 1.29; p = 0.542)	3/A
Belzer et al. (2014), USA	Phone Call	37 ^a IG: 19 ^b CG: 18	Behavioural	48 weeks/12 months	Self-reported adherence significantly higher in IG compared to CG (p = 0.007)	2/A
Fiscella et al. (2015), USA	Web-enabled Hand-held device plus Personal Health Record	32 ^a IG: Not mentioned ^b CG: Not mentioned	Classic	52 weeks/13 months	Larger improvements in self-efficacy and self-reported adherence in IG	4/A
Claborn et al. (2014), USA	Web Electronic intervention	97 ^a IG: 47 ^b CG: 50	Classic	4 weeks/one month	Self-efficacy and self-reported adherence significantly higher in IG (M ^g = 8.79; SD ^h = 1.34/M:80.53; SD = 26.29) compared to CG (M = 7.96; SD = 1.67/M = 81.40; SD = 25.21).	4/A

^a IG: Intervention group.^b CG: Control group.^c SMS: Short Message Service.^d RR: Risk ratio.^e CI: Confidence interval.^f HR: Hazard ratio.^g M: Mean.^h SD: Standard deviation.

Table 2
Information on the use of technology and the measurement of adherence.

Author/year	Use of technology	Technology providing frequency	Professional who measured the technology	Adherence measurement method	Measurement frequency
Reynolds et al. (2008)	Combined with patient education	Monthly	Nurse	Self-reported adherence	Weeks 4, 16, 48 and 64
Lester et al. (2010)	Combined with appointments	Not mentioned	Nurse or doctor	Self-reported adherence	Weeks 24 and 48
Chung et al. (2011)	Isolated and combined with counselling sessions for HAART	Daily	Pharmacist	Tablets count	Weeks 4,8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72
Pop-Eleches et al. (2011)	Combined with appointments	Daily and weekly	Commercial services provider	Monitoring drug events system	Weeks 4,8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48
Hardy et al. (2011)	Combined with appointments	Daily	Nurse, doctor, pharmacist and counsellor	–Self-reported adherence; –Tablets count; –Monitoring drug events system	Weeks 0, 3 and 6.
Mbuagbaw et al. (2012)	Combined with appointments	Weekly	Secretary	–Visual analogue scale; –Self-reported adherence; –Pharmacy records on replenishment	Weeks 12 and 24
Belzer et al. (2014)	Combined with appointments	Daily	Adherence facilitator	Visual analogue scale	Weeks 6, 12, 24, 36 and 48
Fiscella et al. (2015)	Combined with group sessions and visits	Not mentioned	Doctor	Self-efficacy and Self-reported adherence	Weeks 8–10, 14–24
Claborn et al. (2014)	Combined with counselling	Not mentioned	Pharmacist and Pharmacy's student	–Self-efficacy and Self-reported adherence –Tablets count	Weeks 0 and 4

ment measures of the outcome variable, multiple interventions with various forms of approach and insufficient statistical data.

The use of information and communication technologies to provide health care began in the 1990s, with an expansion in recent years via the mobile web, smartphones and social media. These technologies have proven effective as mediation tools of interaction and health education, with satisfactory cost-benefits. In addition, these technologies constitute innovative means of health promotion and disease prevention [11].

In the context of the HIV epidemic, information technologies have been suggested as tools for expanding access to health care by reducing the geographic barriers and costs involved in infection prevention and treatment. If they are used in combination with standard care, it will be possible to strengthen health services and improvements in care quality [4,25]. The United Nations Programme on HIV (UNAIDS) and the World Health Organization support initiatives focused on mobile communication as a strategic action [6].

African countries suffer from the effects of the AIDS epidemic because they have limited human and material resources to care for people living with HIV, with repercussions related to decreased adherence to ART being observed over time [22,26]. Clinical trials published in this region show consistency with the scientific literature [27,28] and demonstrate the benefits of using information and communication technologies, especially mobile phones to send SMSs [18,22], to improve adherence to ART in places with limited resources. It has been suggested that the application of mobile telephones as a method of caring for people living with the virus in other underdeveloped countries is efficacious.

Mobile telephones have been identified as a care tool in the context of HIV due their feasibility, acceptance, potential for large-scale use, potential for interactive feedback and efficacy [29,30]. The findings of this review support this evidence. Only one clinical trial using mobile phones did not note improved adherence to ART [24]. However, this study utilized monitoring for only six months, whereas in other reviews, monitoring was predominantly

performed for a period equal to or greater than twelve months [16,18,19]. In addition, in this study, the messages had a motivational nature and were not directly associated with ART.

A systematic review on the use of mobile telephones in HIV prevention and treatment analysed 64 publications in its majority descriptive. In addition, similar results to this study were identified in relation to the prevalence of sending text messages as part of the provision of care compared with other technologies. Approximately 60% of the studies analysed in the review provided warnings and reminders, using mobile messages to encourage disease treatment [25].

SMS can be used as a method of asynchronous communication with and without feedback from subjects after they receive messages. The feedback from the subjects after they receive messages, within a specified period, proves to be more effective and strengthens the relationships among stakeholders and enables professional support for problem-solving [22]. However, the potential for the loss of privacy, confidentiality and secrecy should be considered with respect to the use of this technology [24].

Short messages sent by cell phone are associated with high satisfaction indicators in adults with HIV. In addition, they assist in the reduction of errors and forgetfulness and strengthen the link between the patient and the professional from interactive communication among peers [31].

In turn, mobile telephony is a subtype of telephone call whose use allows the provision of information, patient education and development of effective skills that can influence behavioural changes [32]. In monitoring chronic conditions such as HIV infection, it enables real-time problem-solving, with a positive impact on treatment self-efficacy [16].

One of the main advantages of phone calls with respect to adherence to ART is the possibility of establishing synchronous communication, in which the health care provider can prepare the patient to recognize, manage, address and resolve therapy-related problems over time and schedule and remember appointments and outpatient visits with other specialists. Another advantage is the

evaluation of the use of technology and health services in real time [16,19].

The two clinical trials that used phone calls had positive results regarding adherence in adults affected by HIV [16,19], but in one of the trials, the sample was reduced [19]. The authors of these studies issued a warning regarding the generalizability of samples with different characteristics and suggested conducting comparative studies on the efficacy of phone calls and text messaging.

Another type of information and communication technology used to support the treatment of people with HIV is electronic device reminders (pagers), a low-cost technology with easy handling and distribution [17]. Despite these positive points, the literature shows similar results to this review with respect to the limited efficacy of this device in the adherence to ART [27,33,34]. On the other hand, the use of a web-enabled hand-held device (a mobile telephony feature with usability, interaction and versatility superior to pager) combined with interactive Personal Health Record shown to be effective in improving the self-efficacy and self-reported adherence [20].

This result may be correlated with the lack of interpersonal interactions with the user, which differs from mobile telephony, where there is continuous feedback between patient-to-professional or patient-to-patient [31]. The alarm device does not capture barriers to good adhesion, such as depression and stigma, which can be better detected in person [17]. Another factor that contributes to the ineffectiveness of this technology is the ability to generate curiosity by those who live with people with HIV, indirectly violating confidentiality [23].

These review results agree with studies that demonstrate the success of eHealth interventions in Promoting changes in behaviour, self-efficacy, knowledge, and clinical outcomes [35]. There was emphasis on the use of tools such as videos, quiz and web-hand-held device [20,21] to motivate adherence to ART and adherence self-efficacy. In addition, most published studies address the use of eHealth in primary prevention of HIV [10], so, it was not possible to establish more specific comparison.

The relationship between interventions and behavioural change models is an important factor. There is consensus in the literature about the importance of support and professional monitoring guided by emotional processes, such as changes in behaviour of people with HIV [16,17,19]. When motivated, subjects can develop skills to improve adherence [17].

However, the use of only the motivational approach as an intervention framework in ICT is not sufficient [24]. Other behavioural cognitive strategies, such as motivational interviewing, must be used to further improve the efficacy of technologies for adherence to ART. The aim is to promote self-efficacy, social support and coping strategies focused problem-solving and decreasing stress [19].

Despite the available information and diversity of communication technologies, the majority of the abovementioned clinical trials were restricted to mobile phones and pagers. With the popularity of social media and smartphone applications, it is expected that future research will be developed to demonstrate the use of these tools and their efficacy in stimulating adherence to antiretroviral treatment. The existence of studies in the literature on the use of these tools to mediate primary and secondary prevention in the context of HIV has been emphasized [10].

Regarding the quality of the analysed clinical trials, none of the studies reached the maximum score in the Jadad Scale [15]. The cause of this finding was the lack of blinding. Although it was not possible to perform a double-blinded (investigators and people who receive the intervention) study, it is suggested that future clinical trials use simple blinding to minimize bias. Additionally, the randomization technique decreases selection bias [36].

Another important factor to note is the accuracy of the measurements of adherence to ART as an outcome variable for the use of information and communication technologies to support treatment. There are two types of adherence measurement methods: direct and indirect. The direct type measures the presence of antiretroviral drugs in the blood, urine or other bodily fluids by the analysis of metabolites and markers. The indirect type assesses other antiretroviral use indicators by self-reporting, clinical evaluations, reviews of medical records, outpatient care or behavioural observation (pill counts, pharmacy refill records, and electronic drug monitoring) [37]. In this review, we highlighted the indirect methods of adherence measurement.

Interviews and questionnaires based on self-reporting have advantages, such as low cost, ease and application speed, as well as the potential to capture specific information about dosages and adherence to dietary requirements [38]. Despite its high reliability and specificity, self-reporting is susceptible to recall bias and can provide inaccurate information; therefore, it must be combined with other methods [37].

The visual analogue scale (VAS) is an indirect method of adherence measurement that consists of characteristic or attitude measurement instruments that are not easily measured and are subjective. The patient marks a horizontal line length, which represents their perception of their current state [39].

Another indirect method of measuring adherence is the quantification of remaining pills that may be held by the pharmacist for medication refill. It is a measure subject to bias because of the possibility of pill omission by the patient [17]. A more accurate measurement is based on a drug event monitoring system held by the pharmacist that uses microsensors that are located in the medicine bottle, allowing the analysis of the number of openings [17].

5. Conclusion

The use of information and communication technologies in supporting the care of adults with HIV is considered to be effective in improving adherence to ART. The advantages of these technologies include their potential for interaction, collaboration, low cost and use in areas with limited human and material resources for the provision of care. However, access to electronic devices and the need for user training are important considerations.

The most effective type of information and communication technology was the phone, which was used to deliver calls and send alert messages, as well as reminders about taking medications. The electronic device alarm (pager) was not considered to be effective for ART adherence.

A preference for technologies enabling synchronous communication (telephone calls) asynchronously feedback from subjects (SMS) for the formation of closer ties and the promotion of professional support in real time was noted. This review was unable to compare the use of ICTs in combination with standard care with classroom technologies.

The eHealth interventions such as videos, quiz and web-hand-held device were effective to motivate adherence to ART and adherence self-efficacy. It is recommended that clinical trials involving specifically the use of these technologies to support the treatment of HIV are conducted.

The patient follow-up was longer than six months, and the technologies were applied by health professionals (nurses, pharmacists or doctors) or technical professionals. Additionally, the adherence measuring instruments with greater emphasis were self-reported adherence questionnaires, visual analogue scales (VASs) and monitoring drug events systems. Moreover, various measures during adherence follow-up played prominent roles in treatment.

Summary table

What was already known on this topic?

- Information and communication technologies subsidize interventions aimed at patient monitoring or preventing the transmission of HIV by promoting improved accessibility and quality of care.
- The literature highlights the possibility of a positive effect on the levels of satisfaction and patient safety, in addition to improving adherence to antiretroviral therapy with the use of information and communication technologies to support care.

What this study added to our knowledge?

- The use of information and communication technologies to support care in adults with HIV was considered to be effective in improving adherence to ART.
- The most prominent type of information and communication technology was the phone, which was used to deliver telephone calls and send alert messages, as well as reminders about taking medications.
- The electronic device alarm was not considered to be effective for adherence to ART.
- No studies meeting the inclusion criteria focusing on the use of interactive technologies, such as smartphone apps and social media monitoring in adults with HIV, have been found. Therefore, conducting clinical trials regarding the use of these technologies to support the treatment of HIV are recommended.

For future experimental studies on the use of information and communication technologies, we suggest the analysis of interventions mediated by smartphones and social media applications and their association with adherence measurement methods, as well as the conduction of clinical trials of the factorial type (multiple interventions), detailed descriptions of randomization and the use of simple blinding.

Finally, information technologies are an instrument of proven efficacy and great cost-benefits with respect to the expansion of access to care. Moreover, this review also highlighted the narrowing of the relationship between patients and health services, with the possibility of mitigating the difficulties experienced by people with HIV in achieving optimal levels of adherence to ART.

Authors' contributions

The author ICVL participated in the management of the systematic review wording process. The authors ICVL and HOA contributed during the different stages of the review, including the selection of articles and the critical reading and analysis of abstracts and selected articles. The researchers MTGG, FETL and TLA critically analysed the construction of the article and provided comments. Finally, all authors read and approved the final version of the manuscript.

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