Health Informatics Meets eHealth
D. Hayn and G. Schreier (Eds.)

doi:10.3233/978-1-61499-759-7-319

Web and Mobile Based HIV Prevention and Intervention Programs Pros and Cons – A Review

Sharareh NIAKAN[a], Esmaeil MEHRAEEN[a,1], Tayebeh NOORI[a], Elahe GOZALI[a]
[a] *Department of Health Information Management, Tehran University of Medical Sciences, Tehran, Iran*

Abstract. Background: With the increasing growth of HIV positive people the use of information and communication technologies (ICT) can play an important role in controlling the spread of the AIDS. Web and Mobile are the new technologies that young people take advantage from them. Objectives: In this study a review to investigate the web and mobile based HIV prevention and intervention programs was carried out. Methods: A scoping review was conducted including PubMed, Science direct, Web of Science and Proquest to find relevant sources that published in 2009 to 2016. To identify published, original research that reported the web and mobile-based HIV prevention and intervention programs, an organized search was conducted with the following search keywords in combination: HIV, AIDS, m-Health, Mobile phone, Cell phone, Smartphone, Mobile health, internet, and web. Results: Using the employed strategies, 173 references retrieved. Searched articles were compared based on their titles and abstracts. To identify duplicated articles, the title and abstracts were considered and 101 duplicated references were excluded. By going through the full text of related papers, 35 articles were found to be more related to the questions of this paper from which 72 final included. Conclusion: The advantages of web and mobile-based interventions include the possibility to provide constancy in the delivery of an intervention, impending low cost, and the ability to spread the intervention to an extensive community. Online programs such as Chat room-based Education program, Web-based therapeutic education system, and Online seek information can use for HIV/AIDS prevention. To use of mobile for HIV/AIDS prevention and intervention, programs including in: Health system focused applications, Population health focused applications, and Health messaging can be used.

Keywords. Web, Mobile, Prevention, Intervention, HIV, AIDS

1. Introduction

In recent decades the AIDS Prevalence rate is expanding, consequently its control is overtaking of human progression [1].With the growing of AIDS outbreaks, one of the approaches found helpful to improve the quality of health care and increase the effectiveness and efficiency of health care services organization is the use of Information Technology (IT) [2,3] that can play an important role in controlling the spread of the disease. Also, it should be noted that prevention, treatment, care and protection of the HIV positive persons' rights are key factors in AIDS intervention programs [4,5]. Mobile health and smartphones are the important achievements of IT that could use by people with long term conditions such as AIDS to execute of remote health control and self-

[1] Corresponding author: Esmaeil MEHRAEEN, Tehran University of Medical Sciences, Qhods Square, Post Code: 7134845794, Tehran, Iran. E-mail: es.mehraeen@gmail.com.

management strategies [6-8]. AIDS treatment processes include the steps that must be performed and followed by the own patients as well as should be accomplished continuously for a long time [9,10]. When a patient doesn't take of his/her drugs in a timely manner, resistance of HIV virus against the medication will be common, as a result, the drugs should be administered at a more and more dose and this will lead to increased cost and side effects. In the other hand, another important point about AIDS patients is on-time taking of prescribed medications and Mobile-based prevention and intervention programs can be offer timely reminders for medication, exercise or food regimens [11-13].

With the rise of smart phone technology, there are new opportunities to consider the role of social media in HIV care and prevention. Smart phones have successfully been used to support aspects of HIV care and treatment. For example, mobile phone text message interventions significantly improve adherence to antiretroviral therapy [14-16]. In addition to the primary use of mobile technology such as talking and text messaging (SMS), growing proportion of users are now using mobile devices capable of accessing the Web and Internet [17,18]. Furthermore, with increased access to mobile technologies, there are more opportunities for the application of mobile health (m-health) strategies in the delivery of HIV prevention and intervention programs [19,20]. Prevention and intervention programs are most effective when they include easily usable, individually tailored, multifunctional adherence tools familiar to the patient, which do not alert others [21,22]. Once developed, web and mobile-based interventions may be relatively inexpensive to implement and deliver via the internet [23,24]. In this paper, we undertook a scoping review on new and emerging research on HIV related Web and mobile–based prevention and interventions.

2. Methods

The aim of this study is to review of Web and Mobile-Based HIV Prevention and Intervention Programs. In this paper we conduct a scoping review of prevention and intervention programs for HIV positive people that use a web or mobile technology for these programs. Research questions including: 1. What are the Web-Based HIV/AIDS Prevention Programs? 2. What are the Web-Based HIV/AIDS Intervention Programs? 3. What are the Mobile-Based HIV/AIDS Prevention/ Intervention Programs? 4. What are the Mobile-Based HIV/AIDS Intervention Programs?

2.1. Research strategy

In this phase we searched PubMed, Science direct, Web of Science and Proquest to find relevant sources that published in 2009 to 2016. To identify published, original research that reported the Web and Mobile-Based HIV Prevention and Intervention Programs, an organized search was conducted with the following search keywords in combination: HIV, AIDS, m-Health, Mobile phone, Cell phone, Smartphone, Mobile health, internet, and web.

2.2. Include & Exclude Criteria

In this study we considered the following criteria to select the relevant sources: Key words: Only full text papers with the keywords in the title or abstracts were selected.

Table 1. Search result from different databases

Research Question	Total Reference Retrieved	Total Duplicate References	Final Included Papers	Analyzed Articles
RQ1	52	31	21	10
RQ2	51	30	21	10
RQ3	29	17	12	6
RQ4	41	23	18	9
Total	173	101	72	35

Date of publication: The studies published between 2009 and 2016 were reviewed. Language: Only studies published in English were searched. Type of a study: The research and review articles were reviewed, and we excluded resources such as reports, editorial letters, newspapers, and other type of sources.

3. Results

In this study using the strategies described above, 173 references retrieved. Searched articles were compared based on their titles and abstracts. To identify duplicated articles, the title and abstracts were considered and 101 duplicated references were excluded. By going through the full text of related papers, 35 articles were found to be more related to the questions of this paper from which 72 final included (Table 1).

3.1. Information extraction

In this paper we review HIV/AIDS preventions and intervention programs that using web and mobile technologies (Table 2, 3). Table 4 shows final articles that be used for the purpose of analysis and investigation of research questions.

4. Discussion

4.1. Research questions 1, 2

Internet communities, news and discussion groups, Chat room-based programs, e-mail lists, websites, online programs and electronic reports are examples of Web-Based applications that offer unique opportunities for electronic communication [25,26].

Table 2. Research questions results

Web-based Programs	Mobile-based Programs
Prevention: Chat room-based Education program, Web-based therapeutic education system (TES), Website support learning, Online seek information, Intervention: Web-based e-health education intervention, Web-based Tailored Intervention, Internet-based Video-Group Delivery of Healthy Relationships, Interactive Web-Based Screening and Brief Intervention, Online Group-based Interventions, CyberSenga Internet based program, HIT System	Prevention: Patient-care focused applications, Health system focused applications, Population health focused applications, Text Messages, Educational Text Messages, Multimedia text messaging boosters, Two-way supportive text-message, Intervention: SMS/MMS physical activity intervention, Text Message Reminders, Health Messaging, On-line chatting, Social networking sites, Cell phone conversations

Table 3. Utility of web and mobile for HIV prevention and intervention

	Web-based	**Mobile-based**
Prevention	Knowledge promotion	Education
Intervention	Stigma and Social relationship management	Self-management, Physical activity tracking, Reminding

Technology and Web-based HIV/AIDS Prevention Programs may be a practical and low-cost method for knowledge increasing of people in healthcare field and can be used to inform people with chronic condition [27,28]. The HIV/AIDS disease prevention program within the Web-based therapeutic education system (TES) is an actual aide as a prevention program for healthy and high risk people and HIV positive persons that not diagnosed [29]. Moreover, vast databases that are accessible via the Internet can possess users for extensive information about various diseases. Therefore, the use of online information is very helpful on awareness and prevention of diseases [30,31]. The World Health Organization announced that sex is one of the common ways to transmission of the HIV virus (especially in developing countries) and Web-based applications can been used to reach men who have sex with men (MSMs) [32,33]. Although, to reduce people with Sexually Transmitted Infections (STI) and HIV condition, an online HIV/STI prevention program can be used. The high popularity of web-based programs and the willingness to contribute in an online HIV/STI prevention program suggest the possibility of delivering intervention for highly mobile and stigmatized population. With expanding access to the Internet in developing countries, online delivery of HIV/STI prevention programs in resource-limited settings appears promising [23,34].

In recent decades people with HIV condition involved in important challenges such as low health literacy, healthy relationship, stigma and disclosure of HIV status. Using a web-based intervention program, HIV positive people get/obtain useful information related to how mange the infection disease using proper medication without referring to healthcare center personally [35,36]. Internet-based Video-Group Delivery of Healthy Relationships, Web-based Tailored Intervention, Interactive Web-Based Screening and Brief Intervention are internet-based technologies that can be expanding access to effective behavioral interventions and reducing the HIV stigma, depressive symptoms and the risk of HIV infection among a group of high-risk [37-41]. Internet-based HIV interventions such as CyberSenga and HITSystem are increasingly common and can be used as a social support tool among people living with HIV [42]. Online Group-based Interventions are a common trend to influence social support and increase inspiration for positive behavior adjustment. Such interventions can potentially decrease HIV-related shame, stigma, and risk behaviors, and promote patients' ability for corporation in social activities and then increase social support of them [43,44].

4.2. Research question 3,4

Multimedia Text Messages, Population Health-focused applications, Health System-focused applications, and Patient-care focused applications are the mobile-Based Programs for HIV care and prevention [45,46]. These prospects of m-health can be used for Physical Activity Tracking (PAT), education, and reminding to taking medication or to alert patient about particular condition [16,47]. M-health also can be improving adherence to antenatal care (ANC) and postnatal care (PNC) and enhance Prevention of Mother-to-Child Transmission of HIV efforts [48]. Cornelius et al, developed and pretested Multimedia HIV-Prevention Text Messages for Mobile Cell Phone (MCP)

Table 4. Summary of final studied articles and their relevance to the research questions (RQ)

ID	First Author	Year	Reference	Results related to RQ			
				1	2	3	4
1	Luenen SV	2016	40		√		
2	Henry BL	2016	58				√
3	Jongbloed K	2016	51			√	
4	Marsch LA	2015	29	√			
5	Billings DW	2015	39		√		
6	Montoya JA	2015	56				√
7	Mushamiri L	2015	48			√	
8	Tufts KA	2015	53				√
9	Cote J	2015	38		√		
10	Blackstock OJ	2015	42		√		
11	Blackstock OJ	2015	43		√		
12	L'Engle KL	2015	61				√
13	Villegas N	2015	31	√			
14	Rose CD	2015	41		√		
15	Forrest JI	2015	16			√	
16	Kessler SF	2015	44		√		
17	Jacobs RJ	2014	35		√		
18	Villegas N	2014	30	√			
19	Montoya JL	2014	62				√
20	Odeny TA	2014	14			√	
21	Ybarra ML	2014	64	√			
22	Danielson CK	2013	23	√			
23	Miller CWT	2013	55				√
24	Catalani C	2013	46			√	
25	Marhefka SL	2013	37		√		
26	Belzer ME	2013	63				√
27	Kasatpibal N	2012	32	√			
28	Ybarra M	2012	26		√		
29	Muessig KE	2012	60				√
30	Rosser BRS	2011	27	√			
31	Cornelius JB	2011	49			√	
32	Hong Y	2011	34	√			
33	Chang LW	2011	59				√
34	Rhodes S	2010	28	√			
35	Bull S	2009	25	√			

delivery and addressed that this technology can be used by healthcare centers to educate and promote of consumer knowledge [49]. Much of the existing evidence on mobile-based HIV/AIDS prevention programs has focused on improving HIV knowledge by providing HIV prevention messages [50]. However, Jongbloed et al, have investigated the potential for a two-way supportive text-message program to reach out to young drug-using indigenous people to reduce vulnerability to HIV infection [51].

The exploration of mobile-based HIV/AIDS intervention programs in healthcare organizations may be a practical and low-cost method for increasing the ability of people with chronic diseases in self-management [52-54]. Miller et al, declared that the vast

majority of patients in an urban HIV clinic own mobile phones and would use them to enhance adherence interventions to HIV medication [55]. Montoya et al, in a randomized controlled trial study concluded that utilization of Short Message Service (SMS) intervention can be increased physical activity and subsequently improve neurocognitive functioning in HIV-positive people [56]. Short Message Service/Multimedia Message Service (SMS/MMS) intervention can be used to monitor and encourage physical activity in persons with HIV and the results indicate that using an SMS/MMS physical activity intervention improve functioning in HIV-positive persons. Chang et al, in qualitative analyses found that use of text message feature of mobile can be improve patient activity and facilitate healthcare delivery by Peer Health Workers on AIDS Care [57-59]. Because evidence show that people who seek sexual partners online are at increased risk for HIV exposure and transmission through their risk behaviors, mobile-based technologies providing HIV education programs such as communication through text messaging and Internet (on-line chatting, social networking sites) for HIV intervention [60]. Furthermore, Mobile-based interventions provide common technique to address several of the key barriers to good medication adherence and promote antiretroviral therapy (ART) adherence by providing reminders for care and a direct connection to health providers [61-64].

5. Conclusion

Web and Internet is a rich source of useful health information for different knowledge level individuals. Web-based prevention programs, such as Chat room-based education program and Web-based therapeutic education system (TES) can be useful in raising awareness, knowledge promotion and prevent HIV infection. Programs such as web-based e-health education intervention, Online Group-based Interventions, and HIT System can be effective to improve medication adherence in HIV positive people. Mobile phone has many advantages such as physical activity tracking, synchronization with social network and reminding compared to web. However, the use of mobile and web-based technologies in combination is the best solution for the prevention and intervention of AIDS. Mobile-based applications such as SMS/MMS, Text Message Reminders, Health Messaging and On-line chatting will be useful to find healthy sex partner and to find health information and provide common technique to address several of the key barriers to good medication adherence, self-management and promote antiretroviral therapy.

References

[1] Dalal N, Greenhalgh D, Mao X. A stochastic model of AIDS and condom use. Journal of Mathematical Analysis and Applications. 2007;325(1):36-53.
[2] Mehraeen E, Ayatollahi H, Ahmadi M. Health Information Security in Hospitals: the Application of Security Safeguards. Acta Informatica Medica. 2016;24(1):47-50.
[3] Mehraeen E, Ghazisaeedi M, Farzi J, S M. Security Challenges in Healthcare Cloud Computing: A Systematic Review. Global Journal of Health Science. 2016;9(3):1-10.
[4] Igodan C. E, Akinyokun O.C, Olabode O. Online Fuzzy-Logistic Knowledge Warehousing and Mining Model for the Diagnosis and Therapy of HIV/AIDS. International Journal of Computational Science and Information Technology. 2013;1(3):27-40.
[5] Alpay L, van der Boog P, Dumaij A. An empowerment-based approach to developing innovative e-health tools for self-management. Health informatics journal. 2011;17(4):247-55.

[6] Arie S. Can mobile phones transform healthcare in low and middle income countries? BMJ. 2015;350(13)19-32.
[7] Dexheimer JW, Borycki EM. Use of mobile devices in the emergency department: A scoping review. Health informatics journal. 2015;21(4):306-15.
[8] Pandher PS, Bhullar KK. Smartphone applications for seizure management. Health informatics journal. 2016;22(2):209-20.
[9] Mbuagbaw L, Mursleen S, Lytvyn L, Smieja M, Dolovich L, Thabane L. Mobile phone text messaging interventions for HIV and other chronic diseases: an overview of systematic reviews and framework for evidence transfer. BMC health services research. 2015;15:33.
[10] Darlow S, Wen KY. Development testing of mobile health interventions for cancer patient self-management: A review. Health informatics journal. 2016;22(3):633-50.
[11] Ramanathan N, Swendeman D, Comulada WS, Estrin D, Rotheram-Borus MJ. Identifying preferences for mobile health applications for self-monitoring and self-management: focus group findings from HIV-positive persons and young mothers. International journal of medical informatics. 2013;82(4):e38-46.
[12] Sims MH, Fagnano M, Halterman JS, Halterman MW. Provider impressions of the use of a mobile crowdsourcing app in medical practice. Health informatics journal. 2016;22(2):221-31.
[13] Muntaner A, Vidal-Conti J, Palou P. Increasing physical activity through mobile device interventions: A systematic review. Health informatics journal. 2016;22(3):451-69.
[14] Odeny TA, Newman M, Bukusi EA, McClelland RS, Cohen CR, Camlin CS. Developing content for a mHealth intervention to promote postpartum retention in prevention of mother-to-child HIV transmission programs and early infant diagnosis of HIV: a qualitative study. PloS one. 2014;9(9):e106383.
[15] Xia Q, Westenhouse JL, Schultz AF, Nonoyama A, Elms W, Wu N, et al. Matching AIDS and tuberculosis registry data to identify AIDS/tuberculosis comorbidity cases in California. Health informatics journal. 2011;17(1):41-50.
[16] Forrest JI, Wiens M, Kanters S, Nsanzimana S, Lester RT, Mills EJ. Mobile health applications for HIV prevention and care in Africa. Current opinion in HIV and AIDS. 2015;10(6):464-71.
[17] Househ M. The role of short messaging service in supporting the delivery of healthcare: An umbrella systematic review. Health informatics journal. 2016;22(2):140-50.
[18] Speirs KE, Grutzmacher SK, Munger AL, Messina LA. Recruitment and retention in an SMS-based health education program: Lessons learned from Text2BHealthy. Health informatics journal. 2016;22(3):651-8.
[19] Labrique AB, Vasudevan L, Kochi E, Fabricant R, Mehl G. mHealth innovations as health system strengthening tools: 12 common applications and a visual framework. Global health, science and practice. 2013;1(2):160-71.
[20] Pop-Eleches C, Thirumurthy H, Habyarimana JP, Zivin JG, Goldstein MP, de Walque D, et al. Mobile phone technologies improve adherence to antiretroviral treatment in a resource-limited setting: a randomized controlled trial of text message reminders. AIDS (London, England). 2011;25(6):825-34.
[21] Page TF, Horvath KJ, Danilenko GP, Williams M. A cost analysis of an Internet-based medication adherence intervention for people living with HIV. Journal of acquired immune deficiency syndromes (1999). 2012;60(1):1-4.
[22] Kirk GD, Himelhoch SS, Westergaard RP, Beckwith CG. Using Mobile Health Technology to Improve HIV Care for Persons Living with HIV and Substance Abuse. AIDS research and treatment. 2013;13(11):17-26.
[23] Danielson CK, McCauley JL, Jones A, Borkman AO, Miller S, Ruggiero KJ. Feasibility of Delivering Evidence-Based HIV/STI Prevention Programming to A Community Sample of African-American Teen Girls via the Internet. AIDS education and prevention : official publication of the International Society for AIDS Education. 2013;25(5):394-404.
[24] Ybarra ML, Bull SS. Current trends in Internet- and cell phone-based HIV prevention and intervention programs. Current HIV/AIDS reports. 2007;4(4):201-7.
[25] Bull S, Pratte K, Whitesell N, Rietmeijer C, McFarlane M. Effects of an Internet-based intervention for HIV prevention: the Youthnet trials. AIDS and behavior. 2009;13(3):474-87.
[26] Ybarra ML, Biringi R, Prescott T, Bull SS. Usability and navigability of an HIV/AIDS internet intervention for adolescents in a resource-limited setting. Computers, informatics, nursing : CIN. 2012;30(11):587-95.
[27] Rosser BR, Wilkerson JM, Smolenski DJ, Oakes JM, Konstan J, Horvath KJ, et al. The future of Internet-based HIV prevention: a report on key findings from the Men's INTernet (MINTS-I, II) Sex Studies. AIDS and behavior. 2011;15(1):91-106.

[28] Rhodes SD, Hergenrather KC, Duncan J, Vissman AT, Miller C, Wilkin AM, et al. A Pilot Intervention Utilizing Internet Chat Rooms to Prevent HIV Risk Behaviors Among Men Who Have Sex with Men. Public Health Reports. 2010;125(1):29-37.
[29] Marsch LA, Guarino H, Grabinski MJ, Syckes C, Dillingham ET, Xie H, et al. Comparative Effectiveness of Web-Based vs. Educator-Delivered HIV Prevention for Adolescent Substance Users: A Randomized, Controlled Trial. Journal of substance abuse treatment. 2015;59(11):30-7.
[30] Villegas N, Santisteban D, Cianelli R, Ferrer L, Ambrosia T, Peragallo N, et al. The development, feasibility and acceptability of an Internet-based STI-HIV prevention intervention for young Chilean women. International nursing review. 2014;61(1):55-63.
[31] Villegas N, Santisteban D, Cianelli R, Ferrer L, Ambrosia T, Peragallo N, et al. Pilot testing an internet-based STI and HIV prevention intervention with Chilean women. Journal of nursing scholarship : an official publication of Sigma Theta Tau International Honor Society of Nursing / Sigma Theta Tau. 2015;47(2):106-16.
[32] Kasatpibal N, Viseskul N, Srikantha W, Fongkaew W, Surapagdee N, Grimes RM. Developing a web site for human immunodeficiency virus prevention in a middle income country: a pilot study from Thailand. Cyberpsychology, behavior and social networking. 2012;15(10):560-3.
[33] Fasula AM, Fogel CI, Gelaude D, Carry M, Gaiter J, Parker S. Project power: Adapting an evidence-based HIV/STI prevention intervention for incarcerated women. AIDS Educ Prev. 2013;25(3):203-15.
[34] Hong Y, Li X, Fang X, Lin X, Zhang C. Internet use among female sex workers in China: implications for HIV/STI prevention. AIDS and behavior. 2011;15(2):273-82.
[35] Jacobs RJ, Caballero J, Ownby RL, MN K. Development of a culturally appropriate computer-delivered tailored internet-based health literacy intervention for spanish-dominant hispanics living with HIV. BMC Medical Informatics and Decision Making. 2014;14(103):1-10.
[36] Robinson C, Graham J. Perceived Internet health literacy of HIV-positive people through the provision of a computer and Internet health education intervention. Health information and libraries journal. 2010;27(4):295-303.
[37] Marhefka SL, Iziduh S, Fuhrmann HJ, Lopez B, Glueckauf R, Lynn V, et al. Internet-based video-group delivery of Healthy Relationships--a "prevention with positives" intervention: report on a single group pilot test among women living with HIV. AIDS care. 2013;25(7):904-9.
[38] Côté J, Cossette S, Ramirez-Garcia P, De Pokomandy A, Worthington C, Gagnon M-P, et al. Evaluation of a Web-based tailored intervention (TAVIE en santé) to support people living with HIV in the adoption of health promoting behaviours: an online randomized controlled trial protocol. BMC Public Health. 2015;15(3):10-24.
[39] Billings DW, Leaf SL, Spencer J, Crenshaw T, Brockington S, Dalal RS. A Randomized Trial to Evaluate the Efficacy of a Web-Based HIV Behavioral Intervention for High-Risk African American Women. AIDS and behavior. 2015;19(7):1263-74.
[40] van Luenen S, Kraaij V, Spinhoven P, Garnefski N. An Internet-based self-help intervention for people with HIV and depressive symptoms: study protocol for a randomized controlled trial. Trials. 2016;17(3):172-185.
[41] Dawson Rose C, Cuca YP, Kamitani E, Eng S, Zepf R, Draughon J, et al. Using Interactive Web-Based Screening, Brief Intervention and Referral to Treatment in an Urban, Safety-Net HIV Clinic. AIDS and behavior. 2015;19(2):186-93.
[42] Blackstock OJ, Haughton LJ, Garner RY, Horvath KJ, Norwood C, Cunningham CO. General and health-related Internet use among an urban, community-based sample of HIV-positive women: implications for intervention development. AIDS care. 2015;27(4):536-44.
[43] Blackstock OJ, Shah PA, Haughton LJ, Horvath KJ, Cunningham CO. HIV-infected Women's Perspectives on the Use of the Internet for Social Support: A Potential Role for Online Group-based Interventions. The Journal of the Association of Nurses in AIDS Care: JANAC. 2015;26(4):411-9.
[44] Finocchario-Kessler S, Odera I, Okoth V, Bawcom C, Gautney B, Khamadi S, et al. Lessons learned from implementing the HIV infant tracking system (HITSystem): A web-based intervention to improve early infant diagnosis in Kenya. Healthcare. 2015;3(4):190-5.
[45] Speizer IS, Gomez AM, Stewart J, Voss P. Community-level HIV risk behaviors and HIV prevalence among women and men in Zimbabwe. AIDS Educ Prev. 2011;23(5):437-47.
[46] Catalani C, Philbrick W, Fraser H, Mechael P, Israelski DM. mHealth for HIV Treatment & Prevention: A Systematic Review of the Literature. The open AIDS journal. 2013;7:17-41.
[47] de Tolly K, Skinner D, Nembaware V, Benjamin P. Investigation into the use of short message services to expand uptake of human immunodeficiency virus testing, and whether content and dosage have impact. Telemedicine journal and e-health : the official journal of the American Telemedicine Association. 2012;18(1):18-23.

[48] Mushamiri I, Luo C, Iiams-Hauser C, Ben Amor Y. Evaluation of the impact of a mobile health system on adherence to antenatal and postnatal care and prevention of mother-to-child transmission of HIV programs in Kenya. BMC Public Health. 2015;15(9):102-114.
[49] Cornelius JB, Cato M, Lawrence JS, Boyer CB, Lightfoot M. Development and pretesting multimedia HIV-prevention text messages for mobile cell phone delivery. The Journal of the Association of Nurses in AIDS Care : JANAC. 2011;22(5):407-13.
[50] [50] Forsyth AD, Valdiserri RO. A State-Level Analysis of Social and Structural Factors and HIV Outcomes Among Men Who Have Sex With Men in the United States. AIDS Educ Prev. 2015;27(6):493-504.
[51] Jongbloed K, Friedman AJ, Pearce ME, Van Der Kop ML, Thomas V, Demerais L, et al. The Cedar Project WelTel mHealth intervention for HIV prevention in young Indigenous people who use illicit drugs: study protocol for a randomized controlled trial. Trials. 2016;17(1):128-138.
[52] Buhi ER, Trudnak RE, Martinasek MP, Oberne AB, Fuhrmann HJ, RJ M. Mobile phone-based behavioural interventions for health: A systematic review. Health Education Journal. 2013;72(5):564-83.
[53] Tufts KA, Johnson KF, Shepherd JG, Lee JY, Bait Ajzoon MS, Mahan LB, et al. Novel interventions for HIV self-management in African American women: a systematic review of mHealth interventions. The Journal of the Association of Nurses in AIDS Care : JANAC. 2015;26(2):139-50.
[54] Himelhoch S, Mohr D, Maxfield J, Clayton S, Weber E, Medoff D, et al. Feasibility of telephone-based cognitive behavioral therapy targeting major depression among urban dwelling African-American people with co-occurring HIV. Psychology, health & medicine. 2011;16(2):156-65.
[55] Miller CW, Himelhoch S. Acceptability of Mobile Phone Technology for Medication Adherence Interventions among HIV-Positive Patients at an Urban Clinic. AIDS research and treatment. 2013:670525.
[56] Montoya JL, Wing D, Knight A, Moore DJ, Henry BL. Development of an mHealth Intervention (iSTEP) to Promote Physical Activity among People Living with HIV. Journal of the International Association of Providers of AIDS Care. 2015;14(6):471-5.
[57] Stephens J, Allen J. Mobile phone interventions to increase physical activity and reduce weight: a systematic review. The Journal of cardiovascular nursing. 2013;28(4):320-9.
[58] Henry BL, Moore DJ. Preliminary Findings Describing Participant Experience With iSTEP, an mHealth Intervention to Increase Physical Activity and Improve Neurocognitive Function in People Living With HIV. The Journal of the Association of Nurses in AIDS Care : JANAC. 2016;27(4):495-511.
[59] Chang LW, Kagaayi J, Arem H, Nakigozi G, Ssempijja V, Serwadda D, et al. Impact of a mHealth intervention for peer health workers on AIDS care in rural Uganda: a mixed methods evaluation of a cluster-randomized trial. AIDS and behavior. 2011;15(8):1776-84.
[60] Muessig KE, Pike EC, Fowler B, LeGrand S, Parsons JT, Bull SS, et al. Putting prevention in their pockets: developing mobile phone-based HIV interventions for black men who have sex with men. AIDS patient care and STDs. 2013;27(4):211-22.
[61] L'Engle KL, Green K, Succop SM, Laar A, Wambugu S. Scaled-Up Mobile Phone Intervention for HIV Care and Treatment: Protocol for a Facility Randomized Controlled Trial. JMIR research protocols. 2015;4(1):e11.
[62] Montoya JL, Georges S, Poquette A, Depp CA, Atkinson JH, Moore DJ. Refining a personalized mHealth intervention to promote medication adherence among HIV+ methamphetamine users. AIDS care. 2014;26(12):1477-81.
[63] Belzer ME, Naar-King S, Olson J, Sarr M, Thornton S, Kahana SY, et al. The use of cell phone support for non-adherent HIV-infected youth and young adults: an initial randomized and controlled intervention trial. AIDS and behavior. 2014;18(4):686-96.
[64] Ybarra ML, Bull SS, Prescott TL, Birungi R. Acceptability and feasibility of CyberSenga: an Internet-based HIV-prevention program for adolescents in Mbarara, Uganda. AIDS care. 2014;26(4):441-7.