EHEALTH AND HIV (J STEKLER AND D KATZ, SECTION EDITORS)

HIV Care Meets Telehealth: a Review of Successes, Disparities, and Unresolved Challenges

Titilola Labisi[1] · Nichole Regan[2] · Precious Davis[2] · Nada Fadul[2,3]

Abstract

Purpose of Review This review summarizes the current state of telehealth utilization in HIV care delivery by highlighting successes, gaps, and unresolved challenges related to access, disparities, care providers in and standardization of policies and protocol.

Recent Findings Telehealth adoption in HIV care delivery in the USA has been successful. Despite this success, racial minority groups, older adults, and individuals with low telehealth literacy report low preference, dissatisfaction, and experience poorer health outcomes than other groups. Lack of broadband access, compatible devices, standardization, and government regulations of telehealth in HIV care contribute to poor patient-provider experience and utilization.

Summary Telehealth remains a valuable tool in HIV care. However, disparities exist in access and health outcomes. Telehealth literacy, broadband access, protecting patients' data, policies, and standardized protocols are critical in sustaining telehealth for HIV care. Further research is needed on preferences and how specific telehealth platforms influence HIV treatment outcomes.

Keywords HIV care · Disparities · Telehealth · COVID-19 · Utilization · Sustainability

Introduction

The emergence of COVID-19 transformed HIV care delivery, giving rise to the rapid adoption of telemedicine to manage HIV [1]. Telemedicine is the remote delivery of clinical services through videoconferencing, telephone, or transmission of medical information between patients and healthcare providers [2]. The term "telemedicine" is used interchangeably with other words such as telehealth and teleconsultation. However, these terms all belong under the broader term "digital health" or "eHealth," which is "the use of electronic resources or technology for health care delivery" [2, 3]. For

consistency in this review, we will focus on telehealth which refers to health care delivery through technology platforms such as mobile phones and computers [2].

As we embrace the novel changes and acknowledge how telehealth has been instrumental during this unprecedented time, particularly by preventing interruption in HIV care and curbing the spread of COVID-19 within the healthcare setting, we must not forget the existing disparities in HIV. The impact of HIV in the USA is disproportionately distributed across demographics and geography. This includes all aspects of HIV, such as prevention, access to management, and treatment outcomes. Racial, ethnic, and gender minority groups face the most significant burden of HIV compared to other groups [4]. Also, the intersectionality of social determinants of health such as economic stability, education access and quality, neighborhood, and built environment are the main contributors to access to telehealth services in this population [5]. Specifically, factors such as low income, unstable housing, and low level of education contribute to disparity [6]. Likewise, the HIV population is aging; nearly half of people with HIV (PWH) are over the age of 50 years and may require special accommodation during telehealth visits [7]. Hence, ensuring telehealth access for all groups is critical in closing the existing disparity gap in HIV care [8]. Most importantly, we cannot end the HIV epidemic without addressing disparities [9].

✉ Titilola Labisi
  titilola.labisi@unmc.edu

[1] Department of Health Promotion and Disease Prevention, College of Public Health, University of Nebraska Medical Center, 984355 Nebraska Medical Center, Omaha, NE 68198-4355, USA

[2] Infectious Diseases Division- Specialty Care Center, Nebraska Medicine, Omaha, NE, USA

[3] College of Medicine, University of Nebraska Medical Center, Nebraska, USA

To that end, reviewing successes, existing gaps, and unresolved challenges in telehealth utilization for HIV care becomes critically important. To understand these, we need to find answers to questions such as: What specific population among PWH are yet to benefit from telehealth? What challenges do healthcare providers face when delivering HIV care through telehealth? How can we sustain telehealth among all PWH? What areas do researchers still need to explore? In answering these questions, we highlight the success, gaps, and unresolved challenges in telehealth use for HIV care (Table 1). In addition, we share our experience and strategies at the University of Nebraska Medical Center (UNMC), Specialty Care Center (SCC).

Successes

Retrospectively, only about 22% of HIV care providers in the USA used telehealth for HIV care delivery before the COVID-19 pandemic [10]. This rate rapidly increased to 99% during the pandemic, according to a Kaiser Family Foundation national survey of Ryan White providers [10]. This rapid adoption has benefited both patients and providers. For example, telehealth accounted for more than a third of all HIV visits at our clinic during the first wave of the COVID-19 pandemic. Prior to the COVID-19 pandemic, telehealth was not utilized at our clinic. Remarkably, 97% of our patients who utilized telehealth remained virally suppressed compared to 91% among patients who had in-person visits [11]. We observed no differences in telehealth utilization based on race, gender, ethnicity, or federal poverty level (FPL) status [12]. A limitation of our study was that patients who were offered telehealth were generally virologically suppressed and adherent to their medications, which may have created selection bias. Nonetheless, these findings were encouraging and enabled our clinic to adopt telehealth as a sustainable way of delivering HIV care to patients living in remote areas of the state or with other identified barriers to being physically present at the clinic.

Table 1 Summary of key findings and recommendations for telehealth sustainability and future research

Key findings	Recommendations
PWH may be willing to use telehealth beyond the pandemic, but social determinants of health and demographic factors are important predictors of utilization and sustainability	Equity in broadband access, particularly in rural regions, is critical in improving telehealth delivery and patient-provider experience. The government should invest in broadband access and provide funding for high-speed internet and compatible devices in underserved communities and rural regions
	Telehealth literacy training and continuous needs assessment for individuals with low income and education or technology literacy would be instrumental in ensuring the existing disparities in HIV treatment outcomes are not widened
There are limited data on telehealth adoption, utilization, and role in HIV treatment outcomes among transgender and people with disabilities	Future research on telehealth utilization for HIV management among transgender and people with disabilities are needed
	Needs assessments and qualitative data on barriers and facilitators to telehealth among transgender and disabled PWH may scale up telehealth utilization and close the literature gap in these populations
Types of telehealth platforms and their roles in HIV treatment outcomes have not been thoroughly investigated	Studies comparing the efficacy, effectiveness, and sustainability of different platforms are needed
	Studies reporting on telehealth should be explicit about telehealth types and how findings may differ based on platforms
Privacy, trust, and policies are persistent challenges in telehealth utilization among patients and providers	Government regulatory agencies should oversee software platforms utilized by different organizations and develop standardized billing policies for HIV care regardless of delivery mode
	Consistency in telehealth terminologies should be adopted to avoid confusion among patients, providers, healthcare payers, and other stakeholders
The COVID-19 pandemic offers opportunities for telehealth sustainability in HIV care	Future studies should investigate changes in telehealth preferences among patients who previously reported a high (or low) preference for telehealth and reasons for any change
	Healthcare organizations utilizing telehealth should adopt user-friendly platforms
	Regardless of prior telehealth experience, continuous patient and provider telehealth education is highly recommended to improve telehealth literacy and sustainability

Similar patterns were mirrored across the USA. At a clinic in San Francisco, telehealth visits made up 54% of all visits during the early phase of the pandemic. Also, patients who had telehealth visits were less likely to miss appointments than those who had in-person visits [13].

Generally, several studies have reported high satisfaction rates with telehealth among PWH [14–16]. Research shows that more than 80% of this population is willing to continue to use telehealth [14]. Indeed, this is a significant increase from 57%, according to a pre-COVID-19 survey of PWH [15]. Similarly, one study revealed that older adults, individuals with low income, and PWH with unsuppressed viral loads did not express low satisfaction with telehealth [17]. Specifically, PWH have mostly expressed satisfaction in telehealth for three main reasons. The first is convenience in not traveling to the clinic [18]. This was also observed at our clinic; a higher proportion of telehealth use was observed among patients who reside outside of Omaha compared to Omaha residents. As the major HIV specialty clinic in the mostly rural region of Nebraska and Southwest Iowa, telehealth has indeed been a valuable tool in reducing transportation-related barriers among our patients. It is important to point out that HIV care visits in non-clinical settings have also been reported as a barrier to telehealth utilization among some patients because of the lack of conducive environments and private spaces to speak with providers remotely [19]. The second main advantage is scheduling flexibility [18]. For instance, visiting the clinic during weekdays and business hours may be difficult for some patients, but telehealth has been invaluable in making some of these visits possible on a patient's lunch break, for example. Thirdly, some researchers found high telehealth satisfaction among patients concerned about HIV-related stigma or being seen at HIV clinics [18].

Among HIV care providers, telehealth has also proven to be a valuable tool [20]. For example, before telehealth adoption, some providers could not evaluate the living condition of their patients. This is a key factor in HIV care because conditions such as neighborhood or poor physical environment, as social determinants of health, can negatively impact HIV treatment outcomes [21]. Providers have expressed high satisfaction with the ability to see patients' surroundings [20]. In addition, caregivers and family members who cannot accompany patients to in-person visits can attend virtually. Another advantage is that providers have the flexibility to offer patients an alternative to in-person visits if patients do not require lab work, rather than canceling or having them not show up [22].

Most importantly, telehealth has empowered both providers and PWH. At our clinic, during the early stages of the pandemic, healthcare providers quickly developed protocols for telehealth visits and educational materials for providers. We also contacted patients to explain the process and

rationale for adopting telehealth. The strategies we employed in implementing our telehealth program have been published elsewhere [11]. Patient empowerment has also been demonstrated in pediatric HIV care, where patients, their parents, or guardians were trained on telehealth literacy [23].

Overall, the adoption of telehealth in HIV care during the pandemic has proven instrumental. In addition, evidence of telehealth use in HIV management, care retention, provider and patient empowerment, and high satisfaction rates have been reported. Notwithstanding, it is critical to consider existing disparities in HIV care and ensure that telehealth is strategically implemented to avoid widening disparities in HIV treatment outcomes [24, 25].

Gaps

Despite the successes noted in the rapid adoption of telehealth to curb the spread of COVID-19 and provide uninterrupted HIV care, gaps persist, particularly in research, services, and implementation policy.

Undoubtedly, providers and patients who have utilized telehealth have benefited from it in some capacity; yet, it is crucial to interpret studies reporting on telehealth in HIV care with caution. Telehealth encompasses different platforms, including video, audio-only (telephone calls), text messaging, web-based content, and applications [2]. Only a few studies have specifically reported and compared the roles of each platform in HIV treatment outcomes. Likewise, patients' preferences for these platforms have not been thoroughly investigated. Although video and telephone visits appear to be the most reported modalities, reasons for having a higher preference for one over the other vary. For example, at healthcare organizations affiliated with larger institutions such as universities, video visits appear to be the primary mode of telehealth delivery, with telephone visits as a backup [26]. Our larger institution (University of Nebraska Medical Center) recommends synchronous video visits as the primary mode of delivery, but our clinic made adjustments based on patients' needs assessment, especially in the initiation phase of telehealth. During the first 6 months of the pandemic, we conducted all of our telehealth visits via telephone (synchronous audio visits) to avoid barriers related to patient's access to a videoconference-ready device and lack of enrollment in the patient portal required to partake in video visits. The urgency in switching from in-person to telehealth visits required us to use the most readily available method of communication with patients. With approximately 40% of our patients living below the FPL, we had concerns about affordability and access to videoconferencing devices and internet connectivity. One of the evolving challenges we faced at the end of the Coronavirus State of Emergency

in June of 2021 in Nebraska state [27] was insurance payers no longer reimbursing for telephone visits. We subsequently conducted outreach to patients to enroll them into the patient portal, the videoconferencing platform for telehealth visits. The lack of research on how access to video visits compare to telephone visits, and reimbursement for the latter, are major barriers for HIV clinics in promoting telehealth to PWH. Further research is needed to understand how specific platforms impact HIV care and treatment outcomes. Also, we need to find answers to the question — did preference for telehealth (including types) change among PWH who initially reported low (or high) preference?

Transgender people are a significant group among PWH [28]. According to a 2020 Centers for Disease Control and Prevention (CDC) report, more than four out of 10 transgender women have HIV [29]. However, there is a dearth of knowledge and data on telehealth utilization among this population. For instance, while some of our transgender patients utilized telehealth in our clinic, the numbers were incredibly small and were not reported for confidentiality purposes. Based on our observation, it is unclear if this is similar across the USA or if this group has a low preference for telehealth. Hence, we suggest more research on implementation and outcomes of telehealth utilization among transgender PWH.

PWH are at a higher risk of episodic or permanent disability because of their condition [30]. Similarly, people with disability are more vulnerable to HIV infection due to their lack of access to testing or limited resources [31]. Unfortunately, little is known about telehealth utilization among people with disabilities and chronic diseases, including HIV, during the pandemic. According to one US study, about 40% of people with disability might have utilized telehealth during the pandemic [32]. However, utilization differed by type of disability and socioeconomic status. For example, people with mobility or cognitive disabilities were more likely to use telehealth than people with hearing or visual disabilities. Also, people with disability with graduate degrees and insurance were more likely to use telehealth compared to other groups [32]. Findings from this US study provide additional supporting evidence for disparities in telehealth utilization. Therefore, it is imperative to investigate the role of telehealth in chronic disease management in this group and its impact on their quality of life, access to care, and health care outcomes.

"Telehealth is a promising public health tool because of its potential to significantly increase access to health care for medically underserved populations, as well as the widespread belief that it can reduce healthcare costs and improve health outcomes overall," according to a CDC article [33]. Does this apply to HIV care? Is telehealth sustainable in this population, and what is the long-term impact on HIV-related and non-HIV-related outcomes among PWH? Answers to these questions may address some concerns related to telehealth sustainability in the HIV population. This is particularly important because HIV management is different from other chronic diseases. For example, a patient with hypertension may not require a blood draw or physical exam, and the diagnosis carries little to no stigma. HIV management, on the other hand, requires routine evaluation of viral suppression via phlebotomy, access to the clinic, and social services such as community gatherings and support to overcome associated stigma. Therefore, the sustainability of telehealth for PWH should be prioritized alongside these other components of HIV care.

Unresolved Challenges

There are opportunities for leveraging and further utilizing telehealth beyond the pandemic [34]. However, addressing issues related to access, disparities, protocols, and policies are critical in making this happen.

Access

Broadband access, referred to as the delivery of high-speed internet, is a requirement in delivering telehealth services [35, 36]. Unfortunately, broadband equity remains a persistent problem in the USA, causing a digital divide (i.e., the gap between people with affordable access, skills, and support to engage in online platforms versus people who are unable to) [35, 36]. It is a serious issue of concern because not every community has the ability to access and utilize reliable high-speed internet to meet their technology-based needs [37]. To be factual, only 5% of households with income above $75,000 did not have broadband in 2018, compared to 38% of households with income below $20,000 [37]. A more recent report from the Center of Medicare and Medicaid Services revealed that although telehealth utilization was up 63 folds during the pandemic, users were mostly urban residents and non-black [38]. Broadband access is critical in HIV care because rural residents represent six percent of PWH [39]. Hence, investment in broadband access, particularly in rural regions, and closing the digital divide gap in minority populations are keys to ending the HIV epidemic [40]. High-speed internet or a stable network is highly essential even among those with access as they impact patient-provider telehealth visit experience and successful engagement [23].

The lack of compatible technological devices also precludes the delivery of telehealth services regardless of broadband access. According to one study, some of the major barriers that prevented patients from video visit attendance was a lack of broadband access and compatible devices [19].
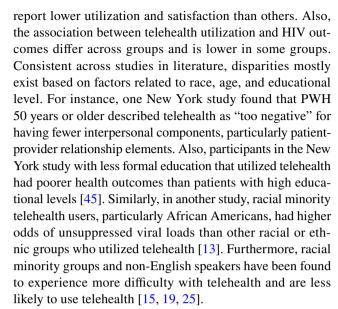
Another study reported that a third of all video clinic visits were discontinued due to patients' lack of digital access [41]. Findings from these studies further illustrate the significance of technological devices and the need to prioritize them alongside broadband access. As transportation is a determining factor in whether a patient will show up for their clinic appointment, telephones, computers, and stable high-speed internet are the primary vehicles for telehealth delivery. Particularly, the lack of these devices will make exploring telehealth as an option for health care delivery among PWH impossible and inhibit our understanding of how telehealth influences HIV treatment outcomes. In addition, investment in telehealth access in rural regions, underserved populations, and eligible patients in need of support is invaluable. For instance, Georgia state invested in its Project Extension for Community Healthcare Outcomes collaborative by ensuring adequate broadband access in rural areas, equipping its rural health departments with necessary equipment (including clinical and technological devices), and training staff to deliver telehealth services. The Georgia program led to improved HIV care visit attendance. It enabled the state's rural health departments to have the capacity for telehealth services and equipped facilities close to rural residents who previously traveled to cities for HIV care [42]. Thus, other government programs may consider expanding their support to sponsor similar initiatives or create subsidized programs to cover the cost of technical devices for eligible patients.

Another issue widely discussed in the literature is billing and reimbursement. Reimbursement of healthcare should not be exclusive to mode of delivery, as telehealth remains a critical tool for healthcare delivery [43]. Inequitable reimbursement and lack of insurance coverage for some telehealth services continue to be barriers to telehealth utilization among providers and patients [25, 42]. For instance, providers may avoid offering patients the option of telehealth if they know their insurance will not cover the cost of their visit. Likewise, patients may hesitate to utilize telehealth to avoid paying out of pocket [34]. The implication is that seeking care from other providers under specific telehealth platforms in an effort to avoid paying out of pocket may negatively impact patient-provider relationships and can result in poor self-management of chronic conditions [44].

Access to telehealth is critical for improved health outcomes. To sustain telehealth among current users and promote adoption for new users, we need to invest in broadband access, close the digital divide gap, support residents and healthcare organizations in rural regions, and regulate payment policies to cover telehealth services.

Disparities

Telehealth utilization, satisfaction, and health outcomes among PWH are not evenly distributed. Specific groups report lower utilization and satisfaction than others. Also, the association between telehealth utilization and HIV outcomes differ across groups and is lower in some groups. Consistent across studies in literature, disparities mostly exist based on factors related to race, age, and educational level. For instance, one New York study found that PWH 50 years or older described telehealth as "too negative" for having fewer interpersonal components, particularly patient-provider relationship elements. Also, participants in the New York study with less formal education that utilized telehealth had poorer health outcomes than patients with high educational levels [45]. Similarly, in another study, racial minority telehealth users, particularly African Americans, had higher odds of unsuppressed viral loads than other racial or ethnic groups who utilized telehealth [13]. Furthermore, racial minority groups and non-English speakers have been found to experience more difficulty with telehealth and are less likely to use telehealth [15, 19, 25].

The findings described above suggest low telehealth technology literacy among the groups experiencing low satisfaction with telehealth and poor health outcomes. The excess burden of poor HIV outcomes has been linked to low health literacy and level of education [46]. Thus, training patients on navigating telehealth platforms is vital, in addition to closing the digital gap. Regardless of patients' prior telehealth experience, healthcare providers should consider incorporating checklists in their protocol to ensure patients can navigate telehealth platforms before proceeding with telehealth visits. We cannot rule out that the lack of this procedure is why some patients opt for telephone visits instead of videoconferencing. Therefore, it is recommended that healthcare organizations adopt and implement telehealth platforms that are user-friendly and easy to navigate. Adopting these platforms and investing in patient education may increase utilization, improve health outcomes, and sustain telehealth in this population.

Protocol and policies

Digital health generally encompasses telehealth, telemedicine, mobile health, telecare, and other terms that are used interchangeably [2, 3]. Though related, these words have different meanings and may confuse patients when used by the same or different providers. For patients with low technology literacy levels, these terminologies may overwhelm them, causing them to be hesitant to try telehealth. Also, some healthcare providers using these words might not realize how they differ and may unintentionally use them interchangeably. Reinforcement through restudying original material improves knowledge retention [47]. Therefore, we recommend constantly training healthcare providers and patients to increase their knowledge of telehealth. In addition, visual explanations are effective in aiding learning [48].

Thus, visual educational materials describing these terms and their differences may be invaluable in improving telehealth literacy among patients and providers.

A persistent and significant concern regarding telehealth utilization among patients is the issue of data security [26, 42, 45, 49]. Consistently reported in the literature, patients are concerned about the breach of data. Various software packages are used in health care delivery; while some organizations have their own software, others consult third parties. For example, the University software, known as "OneChart," is the only telehealth platform allowed at our institution. Regardless of the type of software package, having a regulatory government agency that oversees these platforms and ensures they meet specific requirements would be instrumental in earning patients' trust in telehealth and reassuring them of protected data. Such standardization may consequently lead to resolving the issue of reimbursement (for instance, having policies in place to guide payers on approved or certified software packages).

As we continue to utilize telehealth in health care to manage chronic diseases, it is critical to keep patients and providers abreast with new developments. Particularly in HIV care, constant training and investment in protecting patient data are paramount to positive patient-provider experiences and the sustainability of telehealth in HIV care [42].

Conclusion

We have taken a huge leap in the rapid adoption of telehealth for HIV care delivery since the onset of the COVID-19 pandemic. While some PWH have benefited from this change, several barriers to telehealth services persist (Table 1). Ensuring equitable access through broadband, telehealth device subsidies, patient education, and standardization of telehealth services (including protocol and reimbursement) are critical steps in closing health disparity gaps, improving health outcomes, and sustaining telehealth in this population.

As we continue to provide HIV care through telehealth during the pandemic and with the hopes of sustaining telehealth utilization post-COVID-19 pandemic, it is vital to develop strategies to scale up access, adoption, and address barriers to telehealth aimed at rural regions, older adults, low-income individuals, and racial and ethnic minority groups. Continuous patient and provider education and training are needed to ensure telehealth sustainability. This training should focus on adaptations to telehealth platforms, new policies, and how they contribute to improved health outcomes. More user-friendly platforms should be implemented, and government should oversee these platforms to protect patients' privacy and facilitate billing consistency.

Providers should also constantly ask patients for feedback, compare telehealth visits to in-person visits to ensure the quality of healthcare is not compromised, and avoid contributing to the existing disparity in HIV [1]. This continuous feedback, specifically through qualitative data, can be instrumental in identifying specific facilitators and barriers to telehealth among PWH. Furthermore, healthcare organizations should be flexible in their telehealth requirement; one size does not fit all in chronic disease management. Specifically, in HIV care, some patients may prefer to see their physician in person or via videoconferencing because of the existing patient-provider relationship and opt for telephone with a social worker or mental health staff. Therefore, healthcare organizations should give patients autonomy to choose their preferred mode of delivery for each visit as this can bolster HIV self-management and improve attendance rates [50].

Beyond understanding telehealth satisfaction, utilization rates, and health outcomes among telehealth users, more qualitative research is needed on those who reported low satisfaction and did not have improved health outcomes. We also need to investigate if these individuals were previous telehealth users or never used telehealth. Furthermore, research on specific telehealth platforms is needed. For example, is a telephone visit more feasible in this population and more effective in improving health outcomes than videoconferencing? Research in these areas and answers to these questions may help increase telehealth adoption and sustainability in HIV care post-COVID-19 pandemic.

References

1. Mgbako O, Miller EH, Santoro AF, et al. COVID-19, telemedicine, and patient empowerment in HIV care and research. AIDS Behav. 2020;24:1990–3.
2. Centers for Disease Control and Prevention. Division for heart disease and stroke prevention: telehealth interventions to improve chronic disease. Available from: https://www.cdc.gov/dhdsp/pubs/telehealth.htm. Accessed 13 May 2022.
3. Food and Drug Administration. Digital center for excellence: what is digital health? Available from: https://www.fda.gov/medical-devices/digital-health-center-excellence/what-digital-health. Accessed 13 May 2022.
4. Martin EG, Ansari B, Hart-Malloy R, et al. Racial and ethnic disparities in HIV diagnoses among heterosexually active

persons in the United States nationally and by state, 2018. PLoS One. 2021;16:e0257583.

5. Healthy People 2030. Social determinants of health. Available from: https://health.gov/healthypeople/priority-areas/social-determinants-health. Accessed 3 Jul 2022

6. Caiola C, Docherty SL, Relf M, et al. Using an intersectional approach to study the impact of social determinants of health for African American mothers living with HIV. ANS Adv Nurs Sci. 2014;37:287–98.

7. National Institute on Aging. HIV, AIDS, and older adults. Available from: https://www.nia.nih.gov/health/hiv-aids-and-older-adults. Accessed 11 June 2022.

8. Centers for Disease Control and Prevention. Telehealth practitioner's guide for HIV prevention and care. Available from https://www.cdc.gov/hiv/effective-interventions/library/telehealth/implementation-materials/cdc-hiv-ei-telehealth-practitioners-guide.pdf. Accessed 23 June 2022.

9. National Institute of Health. To end HIV epidemic, we must address disparities. Available from: https://www.nih.gov/news-events/news-releases/end-hiv-epidemic-we-must-address-health-disparities. Accessed 25 June 2022.

10. Dawson L and Kates J. Delivering HIV care and prevention in the COVID era: a national survey of Ryan White providers. Kaiser Family Foundation 2020. Availablefrom: https://www.kff.org/hivaids/issue-brief/delivering-hiv-care-prevention-in-the-covid-eraa-national-survey-of-ryan-white-providers/. Accessed 25 May 2022.

11. Fadul N, Regan N, Kaddoura L, et al. A Midwestern academic HIV clinic operation during the COVID-19 pandemic: implementation strategy and preliminary outcomes. J Int Assoc Provid AIDS Care 2021; 20.

12. Regan NN, Krajewski L, Fadul N. 878. Telemedicine implementation in a Midwestern HIV clinic: one-year outcomes. Open Forum Infect Dis. 2021;8:S531–S531.

13. Spinelli MA, Hickey MD, Glidden DV, et al. Viral suppression rates in a safety-net HIV clinic in San Francisco destabilized during COVID-19. AIDS. 2020;34:2328–31.

14. Auchus IC, Jaradeh K, Tang A, et al. Transitioning to telehealth during the COVID-19 pandemic: patient perspectives and attendance at an HIV clinic in San Francisco. AIDS Patient Care STDS. 2021;35:249–53.

15. Dandachi D, Dang BN, Lucari B, et al. Exploring the attitude of patients with HIV about using telehealth for HIV care. AIDS Patient Care STDS. 2020;34:166–72.

16. Hoagland B, Torres TS, Bezerra DRB, et al. Telemedicine as a tool for PrEP delivery during the COVID-19 pandemic in a large HIV prevention service in Rio de Janeiro-Brazil. Braz J Infect Dis. 2020;24:360–4.

17. Dandachi D, Freytag J, et al. It is time to include telehealth in our measure of patient retention in HIV care. AIDS Behav. 2020;24:2463–5.

18. Barbera LK, Kamis KF, Rowan SE, et al. HIV and COVID-19: review of clinical course and outcomes. HIV Research and Clinical Practice. 2021;22:102–18.

19. Wood BR, Lan KF, Tao Y, et al. Visit trends and factors associated with telemedicine uptake among persons with HIV during the COVID-19 pandemic. Open Forum Infect Dis 2021; 8:1–6.

20. Gloston GF, Day GA, Touchett HN, et al. Pivoting to video telehealth for delivery of HIV care during COVID-19: a brief report. Telemedicine Reports. 2021;2:205–10.

21. Saracino A, Zaccarelli M, Lorenzini P, et al. Impact of social determinants on antiretroviral therapy access and outcomes entering the era of universal treatment for people living with HIV in Italy. BMC Public Health 2018;870:1–12.

22. Koay WLA, Prabhakar S, Neilan A, et al. Supporting access to HIV care for children and youth during the COVID-19 pandemic with telemedicine and rideshare. J Acquir Immune Defic Syndr. 2021;88:384–8.

23. Wood SM, White K, Peebles R, et al. Outcomes of a rapid adolescent telehealth scale-up during the COVID-19 pandemic. J Adolesc Health. 2020;67:172–8.

24. Patel VV, Beil R, Slawek D, et al. HIV prevention and treatment in the context of the COVID-19 in the Bronx, New York: implications for practice and research. AIDS Rev. 2020;22:143–7.

25. Wood BR, Young JD, Abdel-Massih RC, et al. Advancing digital health equity: a policy paper of the Infectious Diseases Society of America and the HIV Medicine Association. Clin Infect Dis. 2021;72:913–9.

26. Coppock D, Quimby C, Nunez J, et al. People living with human immunodeficiency virus during the COVID-19 pandemic: experiences with telemedicine. Health Promot Pract. 2021;22:298–9.

27. Nebraska Department of Health and Human Services. Gov. Ricketts ends coronavirus state of emergency. Available from: https://dhhs.ne.gov/Pages/Gov-Ricketts-Ends-Coronavirus-State-of-Emergency.aspx. Accessed 7 July 2022

28. Labisi TO, Podany AT, Fadul NA, et al. Factors associated with viral suppression among cisgender women living with human immunodeficiency virus in the United States: an integrative review. Womens Health (Lond). 2022;18:17455057221092268.

29. Centers for Disease Control and Prevention. Transgender women urgently need more HIV prevention and treatment services, new CDC data show. Available from https://www.cdc.gov/media/releases/2021/p0414-trans-HIV.html. Accessed 3 July 2022

30. United Nations. Disability and HIV. Available from https://www.un.org/development/desa/disabilities/issues/disability-and-hivaids.html. Accessed 8 August 2022.

31. Hanass-Hancock J. Disability and HIV/AIDS - a systematic review of literature on Africa. J Int AIDS Soc. 2009;12:34.

32. Friedman C, VanPuymbrouck L. Telehealth use by persons with disabilities during the COVID-19 pandemic. Int J Telerehabil. 2021;13:e6402.

33. Centers for Disease Control and Prevention. Public health professionals gateway. Available from: 2022 from https://www.cdc.gov/phlp/publications/topic/anthologies/anthologies-telehealth.html. Accessed 1 June 2022.

34. Weigel G, Ramaswamy A, Sobel L, et al. Opportunities and barriers for telemedicine in the U.S. during the COVID-19 emergency and beyond. Kaiser Family Foundation 2020. Available from: https://www.kff.org/womens-health-policy/issuebrief/opportunities-andbarriers-for-telemedicine-in-the-u-s-during-the-covid–19-emergency-and-beyond/. Accessed 25 May 2022

35. HealthIT.gov. What is broadband and why is broadband access important? Available from: https://www.healthit.gov/faq/what-broadband-and-why-broadband-access-important. Accessed 13 May 2022.

36. Reddick CG, Enriquez R, Harris RJ, et al. Determinants of broadband access and affordability: an analysis of a community survey on the digital divide. Cities. 2020;106:102904.

37. Community Tech Network. Broadband equity and the digital divide. Available from: https://www.communitytechnetwork.org/blog/broadband-equity-and-the-digital-divide/#:~:text=Another%20helpful%20definition%20to%20know,their%20long%2Dterm%20needs.%E2%80%9D. Accessed 13 May 2022.

38. Center of Medicare and Medicaid Services. New HHS study shows 63-fold increase in Medicare telehealth utilization during the pandemic. Available from: https://www.cms.gov/newsroom/press-releases/new-hhs-study-shows-63-fold-increase-medicare-telehealth-utilization-during-pandemic. Accessed 1 June 2022.

39. Iyer M. Understanding health care needs of persons living with HIV/AIDS in rural communities. American Psychological Association 2015. Available from: https://www.apa.org/pi/aids/resources/exchange/2015/01/health-hiv-aids. Accessed 23 June 2022.

40. Kalichman SC, Weinhardt L, Benotsch E, et al. Closing the digital divide in HIV/AIDS care: development of a theory-based intervention to increase Internet access. AIDS Care. 2002;14:523–37.

41. Ennis N, Armas L, Butame S, et al. Factors impacting video tel-
ehealth appointment completion during COVID-19 pandemic
among people living with HIV in a community-based health sys-
tem. AIDS and Behavior 2021;26:407–414.

42. Salgado S, Felzien G, Brumbeloe J. Georgia leverages telehealth
to expand HIV care management in underserved areas. Am J Prev
Med. 2021;61:S55–9.

43. U.S. Department of health and Human Services Office of Inspec-
tor General. Telehealth was critical for providing services to
Medicare beneficiaries during the first year of the COVID-19
pandemic. Available from: https://oig.hhs.gov/oei/reports/OEI-
02-20-00520.asp. Accessed 31 May 2022.

44. Kamimura A, Higham R, Rathi N, et al. Patient-provider rela-
tionships among vulnerable patients: the association with health
literacy, continuity of care, and self-rated health. J Patient Exp.
2020;7:1450–7.

45. Baim-Lance A, Angulo M, Chiasson MA, et al. Challenges and
opportunities of telehealth digital equity to manage HIV and
comorbidities for older persons living with HIV in New York
State. BMC Health Serv Res. 2022;22:1–10.

46. Mgbako O, Miller EH, Santoro AF, et al. COVID-19, Telemedi-
cine, and Patient Empowerment in HIV Care and Research. AIDS
and Behavior 2020;24:1990–1993.

47. Bell DS, Harless CE, Higa JK, et al. Knowledge retention after
an online tutorial: a randomized educational experiment among
resident physicians. J Gen Intern Med. 2008;23:1164–71.

48. Bobek E and Tversky B. Creating visual explanations improves
learning. Cogn Res Princ Implic 2016;1:27–016–0031–6.

49. Harsono D, Deng Y, Chung S, et al. Experiences with telemed-
icine for HIV care during the COVID-19 pandemic: a mixed-
methods study. AIDS Behav. 2022;26:2099–111.

50. Dineen-Griffin S, Garcia-Cardenas V, Williams K, et al. Helping
patients help themselves: a systematic review of self-management
support strategies in primary health care practice. PLoS One.
2019;14:e0220116.