Facilitated telemedicine as a patient-centered, sociotechnical intervention to integrate hepatitis C treatment into opioid treatment programs and overcome the digital divide among underserved populations: Conference workshop thematic analysis

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Abstract

Background: People with opioid use disorder (OUD) have the highest rates of hepatitis C virus (HCV) infection. Despite the availability of curative HCV medication, people with OUD have limited healthcare access largely due to stigma. In a recent, pragmatic, randomized controlled trial (RCT), we compared a facilitated telemedicine intervention for HCV treatment integrated into opioid treatment programs to offsite referral. Facilitated telemedicine is bidirectional videoconferencing between a remote provider and a patient, supported by a case manager who facilitates the telemedicine encounter. In the RCT, we found that facilitated telemedicine overcame the digital divide, promoting access to digital technology, internet provision, and digital literacy. In this work, a multidisciplinary group of investigators, who directed the RCT, conducted a workshop entitled "Advancing Viral Hepatitis Screening and Treatment in Opioid Treatment Settings – Models & Resources". We sought to disseminate knowledge of facilitated telemedicine at the American Association for Treatment of Opioid Dependence Conference in May 2024.

Objective: We identified lessons learned to successfully overcome challenges of facilitated telemedicine implementation for HCV treatment integrated into opioid treatment programs.

Methods: We partnered with the National Alliance of State & Territorial AIDS Directors in planning the workshop. The workshop consisted of seven presentations on topics related to facilitated telemedicine implementation. The workshop was recorded and transcribed by Zoom. The transcripts served as data for the thematic analysis. The transcripts were interpreted to elucidate overall meanings and nuances derived from each presentation. In an iterative process, preliminary findings were compared until consensus was reached. Preliminary findings were aggregated and coalesced into themes. Verbatim quotes from the workshop were highlighted to support the themes.

Results: We developed three themes: (1) Patient-centered care promotes HCV treatment for underserved populations through facilitated telemedicine. Case managers leveraged the destigmatizing environment of the opioid treatment program to build trust with patients, promoting an HCV cure through facilitated telemedicine. (2) Sociotechnical approaches expand healthcare access

for people with OUD. To be effective, facilitated telemedicine integrates two necessary components, a social aspect and a technical aspect. (3) Facilitated telemedicine supports pragmatic research emphasizing people with OUD. A patient advisory committee, peer pipeline, and learning lunches were permissive to overcoming the digital divide. Additional pragmatic trials of facilitated telemedicine are needed to assess sustainability and scaling considerations beyond methadone treatment programs.

Conclusions: Facilitated telemedicine incorporates both a technical and a social component. The technical component largely addresses geographical challenges while the social addresses temporal (i.e., care coordination) issues, promotes trust, and largely assuages patients' concerns related to HCV treatment. The patient-centered, sociotechnical intervention can satisfactorily address the digital divide thereby increasing healthcare access. Clinical Trial: ClinicalTrials.gov Identifier: NCT02933970

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Abstract

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lunches were permissive to overcoming the digital divide. Additional pragmatic trials of facilitated telemedicine are needed to assess sustainability and scaling considerations beyond methadone treatment programs.
Conclusions: Facilitated telemedicine incorporates both a technical and a social component. The technical component largely addresses geographical challenges while the social addresses temporal (*i.e*., care coordination) issues, promotes trust, and largely assuages patients' concerns related to HCV treatment. The patient-centered, sociotechnical intervention can satisfactorily address the digital divide thereby increasing healthcare access.
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Introduction

People with opioid use disorder (OUD) have the highest hepatitis C virus (HCV) incidence and prevalence due to viral transmission through injection drug use [1]. If left untreated, HCV infection can lead to cirrhosis, liver failure and death. The development of almost ubiquitously curable direct-acting antivirals (DAA) for HCV in 2 to 3 months with minimal side effects has profoundly changed the therapeutic landscape since 2013 [2]. Unfortunately, however, people with OUD have had limited access to DAAs, largely due to stigma in conventional healthcare settings, competing priorities, unawareness of their HCV status, and service unavailability [3,4]. A recent nationwide study documented that only 35% of eligible individuals received DAAs from 2013 to 2022 [5]. Additionally, almost 40% of people with HCV are unaware of their infection status [6]. Nonetheless, HCV treatment is a health equity priority [7]. Thus, an HCV therapeutic divide exists with insufficient penetration of highly curative DAAs among the population most in need. Furthermore, people with OUD suffer from a digital divide, defined as the unequal access to digital technology, internet provision, and gaps in digital literacy [8].

Opioid treatment programs (OTPs) provide medical and behavioral treatment for OUD in a destigmatizing, supportive, and trusting environment [9]. Integrating HCV treatment into the OTP environment can promote therapeutic interactions, patient engagement, and retention in healthcare. To potentially overcome the HCV therapeutic divide among people with OUD, we developed a facilitated telemedicine intervention fully integrated into OTPs. Recently published facilitated telemedicine results demonstrated an HCV cure in almost all treated individuals accompanied by high patient satisfaction with healthcare delivery [10-12] (Details of facilitated telemedicine procedures and effectiveness results are provided in Multimedia Appendix). Facilitated telemedicine is bidirectional videoconferencing between a remote provider and patient, supported by a case manager. The case manager established trusting relationships with patients to promote personalized HCV care approaches. The intervention can overcome geographical and temporal challenges, as well as the therapeutic and digital divides. Since facilitated telemedicine encounters are embedded in OTPs facilitated by a case manager, patients had access to digital technology, internet provision, and assistance with digital literacy. Facilitated telemedicine not only increases DAA access among people with OUD, but it can also improve service provision by OTPs.

We sought to understand the components of facilitated telemedicine that successfully overcame implementation challenges. We obtained input from a variety of stakeholders involved in the implementation and conduct of facilitated telemedicine in OTPs. We conducted a workshop entitled “Advancing Viral Hepatitis Screening and Treatment in Opioid Treatment Settings – Models & Resources”. The workshop focused on how facilitated telemedicine delivered patient-centered care for HCV treatment integrated into OTPs. We identified themes that highlight facilitated telemedicine implementation considerations to address the digital divide. We anticipate that the lessons learned could be beneficial in the expansion of facilitated telemedicine to address HCV-OUD treatment integration and health equity among people with OUD.

Methods

Study design, setting, population

We conducted a thematic analysis of the transcripts of a 3.5-hour workshop that addressed facilitated telemedicine implementation challenges. Our study aim was to identify and disseminate successful approaches that overcame facilitated telemedicine implementation challenges. The primary study outcome was the results derived from the thematic analysis. The workshop transcripts served as data for the thematic analysis.

The workshop was sponsored by the University at Buffalo and took place as a pre-conference workshop at the 2024 American Association for the Treatment of Opioid Dependence (AATOD) Conference [13]. The workshop occurred on May 19, 2024 in Las Vegas, Nevada. Planning for the workshop began in 2018 when 3 of the workshop speakers attended the AATOD annual meeting; the workshop planning followed an iterative process as illustrated (Multimedia Appendix). The data analysis occurred in July and August 2024. The complete transcript is included (Multimedia Appendix) and is the raw data used for the thematic analysis.

AATOD works with federal and state agencies to promote the growth and development of opioid treatment services. The association has a long history of promoting approaches to increase HCV management within OTPs, and the workshop concept originated at the 2018 annual meeting where three workshop participants attended. Our workshop aligned with the AATOD conference theme of "Treating Opioid Use Disorder: So Much More Than Medication" [14]. In alignment with the conference objectives, we disseminated the outcomes of facilitated telemedicine among people with OUD. Our workshop attendees included OTP providers, OTP administrators, patient representatives, front line staff, and state officials involved in treatment of OUD.

Study intervention

The workshop activities were approved by the University at Buffalo Institutional Review Board. The PI of the facilitated telemedicine trial (AHT) established a collaboration with the National Alliance of State & Territorial AIDS Directors (NASTAD) in planning the workshop. The alliance's focus is to advance the health of people impacted by HIV, viral hepatitis, and intersecting epidemics through public health advocacy, capacity building, and social justice [15]. NASTAD represents public health officials who administer HIV and viral hepatitis programs in all 50 states. NASTAD representatives participated in developing the workshop's objectives and maintaining the relevance of the workshop to partnering with state and territorial health departments. The planning committee invited workshop speakers based upon their roles and a high degree of engagement in the trial (Multimedia Appendix). An overview of their presentations to provide context for telemedicine implementation is provided (Multimedia Appendix).

Once the speakers had agreed to present at the workshop, they worked iteratively with the planning committee to obtain feedback on the presentations. When the presentations were finalized, each speaker uploaded the presentation to the AATOD website. Workshop speakers met in person prior to the workshop to review the presentations' content and to promote cohesiveness and flow. Speakers reviewed logistical considerations immediately prior to the workshop, including timing, recording and moderation by NASTAD staff. Two question and answer sessions were held during the workshop. After completion of the workshop, the planning committee met to discuss topics for manuscript development.

Thematic analysis

The 3.5-hour workshop was recorded and transcribed by Zoom. All workshop speakers discussed their approaches to overcome facilitated telemedicine implementation challenges, and the workshop transcripts served as the raw data for the thematic analysis. Drs. Dharia and Talal each reviewed the transcripts for formatting and accuracy. Both investigators have several publications on qualitative studies [3,9,16-21] that have all been published in Q1 journals, and they are well versed in the approaches to minimize bias in qualitative analysis [22]. Subsequently, they performed a thematic analysis according to the framework described by Braun and Clarke [23] by interpreting the transcripts to elucidate overall meanings and nuances derived from each presentation. The iterative process commenced with an initial review of the transcripts. Both investigators initially

independently coded and developed lower-level themes and supporting quotations [24]. Once each investigator had independently developed preliminary themes, they discussed their findings while simultaneously comparing them to the transcripts. In the case of disagreements in the textual interpretations, the investigators reviewed the transcripts until consensus was reached.

Once a draft of concepts had been derived and agreed upon, the meanings were discussed with the co-authors, aggregated into higher-level themes, and verified against the transcripts. In an iterative process, the themes were compared and further coalesced into higher-level themes. Verbatim quotes from the workshop were highlighted to support the themes. All workshop participants reviewed the final themes and supporting quotes for agreement.

Results

We developed three themes from the textual analysis of the workshop presentations.

Theme 1: Patient-centered care promotes hepatitis C treatment for underserved populations through facilitated telemedicine.

People with OUD frequently encounter stigma [25] and feel ostracized in conventional healthcare settings. "*They describe themselves as addicts, dirty or clean. Patients blame themselves for contracting a lethal disease [i.e., HCV]. They face stigma in conventional healthcare settings outside of the OTP*." Stigma is a major impediment to healthcare access. "*We had tried multiple attempts to refer out [for HCV]… It was really met dismally. For some, it was logistics. They had a hard time getting to the other location. But for a lot of them, it was stigma*."

A strategy to diminish shame is patient-centered care, promoting individual healthcare choices and empowering patients to actively participate in healthcare decision making [26]. The approaches we used to maintain patient-centeredness are described in the Multimedia Appendix. The growth of patient-centeredness in the treatment of substance use disorders has been gaining considerable momentum [27]. "*The vision of the agency [OTP] is dedicated to transforming the perception of addiction and behavioral health disorders by bringing dignity and respect to the lives, families, and communities we serve*".

To engage people with OUD in research, we pursued approaches to build trust, such as integrating facilitated telemedicine encounters into the supportive, destigmatizing, and trusting environment of the OTP [28,29]. "*The OTP became an extension of their family… A place of trust*." The foundation of facilitated telemedicine is patient-centeredness. Patients endorsed facilitated telemedicine because they realized the profound effects of an HCV cure.

> *For patients that successfully completed [HCV treatment], it was the first major win for them. They realized that they had an active role in their recovery… Having a personal win that they could own was profound and had long term effects.*

An HCV cure represented a major achievement for people with OUD. "*He [study PI] would actually use 'cure', and that's a 4-letter word we don't use in the [methadone] program.*" As one investigator remarked, "*The message to take home, is that once the patient initiates the treatment, you have a high probability that the patient is actually going to stick with it and obtain an HCV cure.*" "*Patients valued the HCV cure because it promoted self-confidence, and it enabled them to improve their health and lives.*"

Among cured participants, we observed significant decreases in substance use, as assessed through the drug abuse screening test [30] with minimal HCV reinfections [12]. An HCV cure enabled the treatment team to reinforce adherence to OUD treatment.

> *When the patients progress through the study, the counselors and the treatment team will often utilize that [HCV cure] as a pivot with the patient… It was a wonderful tool that the treatment team used to support a patient's recovery.*

An HCV cure removed the risk of cirrhosis and improved substance use. "*[The] approach is to treat the whole person, and not just their substance use disorder… They have co-occurring alcohol use disorder… HIV, hepatitis C, diabetes, hypertension, and psychiatric disorders.*"

Consistent with this notion, an OTP administrator cited his desire for participation in facilitated telemedicine as the "full-service garage" concept, providing essential medical care within the OTP for a large repertoire of comorbidities.

> *The full-service garage sentiment is the leverage of the trust equity and utilizing facilitated telemedicine provided a hub and spoke… If OTPs reach out to community providers, it becomes the home base for consumers and facilitated telemedicine becomes the opportunity to engage in essential services without having to leave the clinic.*

Integrated treatment for HCV and OUD can promote improvements beyond medical conditions, specifically social factors. We found that HCV and OUD treatment "*promotes improvements in substance use and social functioning, [specifically] education, employment, and involvement with the legal system*." The OTP supported these activities. "*The patients were actually helped to go back to school and complete whatever degrees they had [to complete]*."

Theme 2: Sociotechnical approaches expand healthcare access for people with opioid use disorder.

When we designed the facilitated telemedicine intervention using the Sociotechnical System (STS) framework [31], we had "*to think about cultural and trust issues that may diminish its acceptability*" [32]. The STS framework is specifically designed to address challenges in telemedicine implementation in adaptive, complex healthcare systems, such as OTPs. The facilitation aspect is the social component of facilitated telemedicine and was critical when designing digital health solutions for people with OUD, including "*case managers who were communicating information about the study, enrollment, retention, and all things hepatitis C beyond the study*" and "*gaining trust in the OTP to participate in patient-centered telemedicine encounters*".

An OTP leader explained his reason for pursuing facilitated telemedicine. "*Our corporate philosophy is recognizing and overcoming OTP-related challenges like continuing relationships and addressing patient needs.*" The benefits of facilitated telemedicine were consistent with the 4 pillars guiding the leadership strategy, "*patient care, education, advocacy, and research… Telemedicine offers a number of opportunities to enhance value-based clinical care.*"

The social structure within the OTP promoted study enrollment and retention. Trust extended to the multidisciplinary team.

> *Early on, the treatment team did a lot of priming of the pump regarding recruitment… I thought it was important to provide education about the study to everyone because the trust equity that the patients have certainly was to the doctors, nurses, and counselors. But sometimes, their strongest relationships were with security staff or a business office person that they saw every day.*

The other aspect of facilitated telemedicine is the technical component. "*If one is thinking about adding a telehealth solution, one needs to consider the digital divide. Specific concerns would be access to the internet, digital health literacy, and medical-behavioral integration with virtual care*." We mitigated digital divide issues, such as technology access, digital health literacy, and broadband access, by fully embedding telemedicine encounters into the OTP. During the COVID-19 pandemic and lockdown, facilitated telemedicine became an approach to maintain patient engagement. "*COVID-19 tethered the consumer away from the clinic… Telemedicine became the umbilicus; it brought the patient back.*"

We developed workflows to extract patient-level data on social factors to support facilitated telemedicine implementation as well as for identifying social factors that might be associated with HCV treatment uptake and cure. These tools enabled cross-domain collaboration as well as played crucial roles in ensuring reproducibility and in optimizing clinical and social data acquisition and their integration [33].

> *Recently, large language models have shown the capacity to process vast amounts of data to generate insights... We are interested in how these models can aid in the identification of social factors… to explore relationships between social factors and pursuit of HCV [treatment].*

These approaches are permissive for direct inclusion of social factors and substance use variables in the patient's treatment plan. The analytical goal is "*to emphasize social factors that can be integrated into the treatment approach*".

Facilitated telemedicine successfully manages the digital divide by addressing both social and technical challenges faced by people with OUD as substantiated in Table 1.

Table 1. Sociotechnical system framework for facilitated telemedicine supported by workshop examples.

Sociotechnical system framework constructs	Definition	Workshop examples	Sociotechnical component
People	Clinicians, patients, administrators, researchers, or software developers.	"Case managers who were communicating information about the study, enrollment, retention, and all things hepatitis C beyond the study." "Gaining trust in the OTP to participate in patient-centered telemedicine encounters."	Social
Internal organizational features	Internal organizational policies, procedures, and institutional culture	"Our corporate philosophy is recognizing and overcoming OTP-related challenges like continuing relationships and	Social

		addressing patient needs... Telemedicine offers a number of opportunities to enhance value-based clinical care.”	
Hardware and software computing infrastructure	Technical requirements, e.g., hardware, equipment, devices, broadband.	“If one is thinking about adding a telehealth solution, one needs to consider the digital divide. Specific concerns would be access to the internet.”	Technical
Human-computer interface	Comfort level and overall user-friendliness of the interface	“COVID-19 tethered the consumer away from the clinic… Telemedicine became the umbilicus; it brought the patient back.”	Sociotechnical
Workflow and communication	Logistics surrounding the proper functioning of the system and ensuring cohesive communication	"I thought it was important to provide education about the study to everyone because the trust equity that the patients have certainly was to the doctors, nurses, and counselors."	Sociotechnical

Abbreviation: opioid treatment program, OTP. Table adopted from [32].

Theme 3: Facilitated telemedicine supports pragmatic research emphasizing people with opioid use disorder.

The tremendous efficacy of DAAs promoted support for pragmatic effectiveness studies for HCV. “*There was real interest in hepatitis C treatment and that opened the channels for funding OUD studies.*” The study sponsor emphasized the pragmatic study approach. “*The studies had to be done in the real world, and they had to include the people who are implementing the treatment and the patient-centered aspects of telehealth.”*

Simultaneously, however, various stakeholders voiced concerns about engaging people with OUD in research.

> *The concerns regarding funding studies in people with OUD very much reflected the ones that payers and providers had… Grave concerns about treating this particular population because of its reputation for being unstable, that they would not complete treatment, would get reinfected, or would disappear.*

Historically, clinical research was largely focused on academia and was considered complete when the study results were published.

Studies were developed by researchers and then evaluated by other researchers… The problem with academic research was that if there was nobody who wanted to implement what was found effective, then nothing happened with it.

Pragmatic studies achieve their full potential when they have long lasting impact. In our case, four of eight sites have continued to use facilitated telemedicine for evaluation of complex cases.

We used a variety of techniques, including the patient advisory committee, peer

pipeline, and learning lunches, to understand and address facilitated telemedicine implementation challenges within the OTP. The patient advisory committee facilitated participant understanding of facilitated telemedicine through recommendations to augment digital literacy. For example, we developed an educational video explaining facilitated telemedicine that we showed to participants during recruitment discussions.

> *We had a patient advisory committee that… formed a very cohesive bond and served as a mechanism for discussion and feedback on study-related interventions even before we implemented them.*

Alongside the patient advisory committee, there was a peer pipeline where patients had the opportunity to endorse study participation to their peers. "*We had a peer pipeline… Patients spoke to other patients that promoted subsequent engagement and maintained retention.*" "*They [patients] became the strongest advocates for enrollment into the study.*"

We discovered that learning lunches were a particularly important mechanism to provide staff education, to facilitate OTP staff and research team interactions and to receive feedback for potential course-correction of study procedures [9].

> *Learning lunches were open for the entire multidisciplinary team… Patient care providers, billing department and our security staff because many of them were seeing the patients every day… Having that opportunity to work through some of those knots was very instrumental to the [study's] success.*

In addition to OTP leadership, patients and study sponsors, stakeholder engagement extended to the clinical and nonclinical staff. It was important to regularly communicate with OTP staff as they managed OTP workflows. Ongoing stakeholder engagement, combined with program funding, were synergistic toward facilitated telemedicine implementation, as explained by OTP leadership.

> *I've come to appreciate the need to have continuing relationships… Those relationships are not just research, but they are also economic. When you can get funding from a research institute to support what you do, it makes a big difference in day-to-day operations.*

HCV treatment access is a health equity priority [7]. Therefore, funding and policy should be evidence-based. "*Public policy is not always driven by science or clinical practice.*" Future research funding should focus on the scaling and sustainability of facilitated telemedicine to promote healthcare access.

> *What we need are some creative solutions to the access problem. Telehealth takes care of part of it, but we also need to think about where telehealth doesn't work… We still have the great digital divide. There are people who have no access to the internet...You have to have some familiarity with the technology… Not everybody has digital literacy*.

Conventionally, explanatory clinical trials sought to evaluate an intervention while controlling for multiple factors [34]. Within the past decade, increasing value is placed on pragmatic research, including stakeholder engagement, implementation evaluation in real-world settings, and sustainability of effective interventions following study completion (Table 2).

Table 2. Comparison between explanatory and pragmatic research related to facilitated telemedicine

implementation.

Domain	Explanatory research	Pragmatic research	Facilitated telemedicine examples
Impact	To gain scientific knowledge	To make real-world changes	Facilitated telemedicine overcoming digital divide
Patient relevance	Patients are typically solely research participants	Usually patient-centered-research matters to patients and caregivers; patient involvement in all study phases	Patients readily view the advantages of facilitated telemedicine
Stakeholder involvement	Largely investigator focused	Multiple stakeholders engaged in all study phases	OTP staff referred patients for facilitated telemedicine
Research design	Extensive exclusion/inclusion criteria often lead to homogenous populations and settings	Real-world settings, populations, contextual assessments; usually parallel or stepped-wedge design usually with a high degree of heterogeneity.	Research in opioid treatment programs with usual workflows, development of a statewide telemedicine network.
Measures	Validated measures that minimize bias; focus on internal consistency	Practical to real-world and low-resource settings; matter to patients	HCV cure, satisfaction with healthcare delivery through telemedicine
Costs	Infrequently collected	Assess cost of intervention	Telemedicine reimbursement
Data sources	Data collection from patients as part of the trial.	Data collected at patient and site level; can use existing datasets (*i.e.*, health records, administrative data, patient lists)	Remote access to electronic health records, case managers faxing laboratory reports
Analyses	Can be per protocol	Intention-to-treat, relevant to multiple stakeholders; goal is understanding implementation process	Patient satisfaction with healthcare delivery through facilitated telemedicine.
Intervention adherence and follow up requirements	Close monitoring and follow up	Can be as usual care	Case managers ensured adherence to study and clinical procedures.
Sustainability	Emphasis on efficacy under ideal circumstances	Emphasis on effectiveness in real-world settings	HCV management of complex cases through telemedicine at 4 sites, onsite HCV treatment at 8 sites after study completion.

Abbreviations: HCV, hepatitis C virus; OUD, opioid use disorder; OTP, opioid treatment program. Table adopted from [34,35].

Discussion

Facilitated telemedicine, through its transcendence of geographical and temporal boundaries, resulted in remarkably high HCV cure rates when integrated into 12 OTPs throughout NYS. Implementing the intervention, however, required convincing stakeholders of the benefits of facilitated telemedicine. We conducted a pragmatic randomized controlled trial in people with OUD that

satisfactorily addressed the digital divide in an underserved population and that successfully implemented a novel healthcare delivery modality using a complex design. We found that open and honest stakeholder discussions were usually sufficient to overcome initial resistance regarding integrating facilitated telemedicine into OTPs. Conducting clinical research in OTPs and recruiting people with OUD were novel concepts when the study was proposed because neither typically participated in research. An initial challenge was convincing stakeholders to endorse a study directed toward the setting and population. An additional challenge was whether true uncertainty (*i.e.*, equipoise) existed between the interventions being tested in the clinical trial. Since it was difficult to establish whether true uncertainty existed, we utilized the stepped wedge design [36]. The concept of using the stepped wedge design was also considered a potential complexity given its stringent enrollment and timing requirements. Patient engagement in a trusting and destigmatizing environment by staff, who had the patients' best interests as their priority, mitigated several of these concerns. From these perspectives, the OTP environment enabled us to fully integrate HCV treatment through facilitated telemedicine into its workflows. After the trial's conclusion, we have continued facilitated telemedicine for evaluation of complex cases in four sites. In eight sites, facilitated telemedicine served as a bridge to onsite HCV treatment by OTP staff. From our investigation, we have learned that facilitated telemedicine can increase healthcare access using a value-based care approach.

The digital divide remains a challenge to the scalability of facilitated telemedicine. The digital divide refers to the unequal access of digital technology, internet provision, and digital literacy that worsens inequality around access to information and resources [8]. In the design of facilitated telemedicine, we considered social and technical aspects, which were facilitated by a case manager. During telemedicine encounters and videoconferencing for patient advisory committee meetings, the case manager facilitated equipment operation. The case manager also addressed patients' questions and concerns and was an information conduit for any HCV-related issues. The importance of considering the social aspects of virtual connectivity was demonstrated most poignantly during the COVID-19 pandemic and lockdown when patient advisory committee meetings occurred weekly (instead of quarterly) through videoconferencing. The committee meetings became an extremely important approach to maintain patient engagement. In resource-limited settings, OTP staff can assume the role of HCV champion. Therefore, facilitated telemedicine has the potential to reach underserved populations and address the digital divide through specific approaches as illustrated (Table 3). More importantly, social interaction and relationship building (i.e., empathy, trust, support, transparency) contributed to the patient-centeredness of facilitated telemedicine. Therefore, telemedicine without the "facilitation" aspect would be devoid of the social component that is crucial for high quality, patient-centered care [18], especially for populations that often experience stigma from various sources. In this context, the social component was largely delivered by the case managers who facilitated the telemedicine encounters, educated patients, and served as patient advocates. Other facilitated telemedicine approaches have employed staff or peers to facilitate the telemedicine encounters [37-39]. The sociotechnical approach also has the potential to present the OTP as a "full-service garage" that can address OUD-related infectious diseases, mental health issues, common comorbidities, and social factors. The novelty of facilitated telemedicine remains the integration of the social and technical aspects for underserved populations.

Table 3: Lessons Learned through Implementation of Facilitated Telemedicine to Overcome the Digital Divide

Topic	Lessons learned and recommendations
Medical	Integrate HCV and opioid use disorder treatment Address medical comorbidities
Social	Minimize stigma against underserved populations

	Maintain patient-centeredness Promote trust Address competing priorities Provide patient education Employ case manager as patient advocate and patient navigator
Technical	Facilitate telemedicine encounter Promote access to technology Ensure sufficient broadband strength Negate digital literacy challenges
Lessons for pragmatic research	Promote learning lunches Establish patient advisory committee Reinforce the importance of HCV cure by OTP staff Disseminate information through peer pipeline Engage stakeholders Emphasize underserved population Consider telemedicine sustainability through reimbursement

Abbreviations: HCV, hepatitis C virus; OTP, opioid treatment program

Healthcare delivery approaches, such as facilitated telemedicine, are most effectively investigated through pragmatic as opposed to explanatory trials. The typical goal of explanatory research is to evaluate the efficacy of an intervention in a controlled setting, whereas pragmatic research evaluates its effectiveness in routine clinical practice settings to maximize applicability, generalizability, and transferability [40]. Explanatory research typically measures clinical symptoms or biological markers, whereas pragmatic research focuses on multiple outcomes, many of which are patient centered. Pragmatic research emphasizes stakeholder involvement, real-world settings and populations, and outcomes that are relevant to patients and stakeholders. Therefore, data collection is typically more laborious and is required from patients, sites, and communities [34]. Additionally, since sites where pragmatic studies are conducted are often part of a healthcare system, they typically share personnel, policies, and resources. Thus, the assumption that study sites are independent of each other, typically observed in explanatory studies, may be violated in pragmatic trials. Proper analysis of pragmatic trial data may require complex statistical models that can account for correlated responses between clusters. In the trial, we were fortunate to have negligible correlation between our study sites [36]. Furthermore, we developed a comprehensive dataset that permitted the analysis of substance use and social factors in relationship to HCV treatment initiation and cure. [41]. Additionally, adequate reimbursement for facilitated telemedicine is critical to its sustainability. Without sufficient reimbursement, facilitated telemedicine for HCV management is unsustainable. Currently, telemedicine reimbursement remains a very important area of debate for the United States Congress after the extension of the COVID-19-era telemedicine exceptions [42].

Strengths and limitations

Strengths of the workshop include multidisciplinary speakers who directed a multi-year study of facilitated telemedicine. The presentations have been substantiated with extensive staff and patient interviews [3,16-18]. Another strength was partnering with national organizations (*i.e.*, AATOD, NASTAD, Patient-centered Outcomes Research Institute) that represent HCV and OUD patients and their caregivers. The workshop provided the opportunity to disseminate the findings of the trial to a national audience that specializes in OUD care. A limitation is nonrecognition of all spoken words by the recording and transcription program. Additionally, a patient-participant was unable to attend the workshop. Fortunately, the patient's voice was communicated through a presentation about patient perspectives derived from a recent publication [3].

Conclusions

We developed facilitated telemedicine as a patient-centered intervention designed to expand DAA access among people with OUD. Because people with OUD may have difficulty crossing the digital divide, we utilized facilitated telemedicine to engage and retain the population in HCV care. A multidisciplinary group of investigators hosted a workshop to disseminate knowledge of facilitated telemedicine for HCV care integrated into OTPs. From the workshop presentations, we identified three themes: Patient-centered care promotes HCV treatment for underserved populations though facilitated telemedicine (Theme 1). Sociotechnical approaches expand healthcare access for people with OUD (Theme 2). While the technical aspect of facilitated telemedicine was conducive to overcoming geographical and temporal obstacles, we had to consider the social aspect in the virtual delivery of HCV care to people with OUD. These were primarily addressed by integrating HCV telemedicine encounters into the destigmatizing, supportive and trusting OTP environment and by facilitation through a case manager.

Facilitated telemedicine supports pragmatic research emphasizing people with OUD (Theme 3). Initial resistance of OTP leadership and frontline staff regarding facilitated telemedicine was effectively mitigated through engagement of a patient advisory committee, a peer pipeline operating within the OTP, and learning lunches. These approaches facilitated participant and OTP staff input on approaches to improve facilitated telemedicine. Addressing the digital divide requires developing patient-centered, sociotechnical innovations for healthcare delivery and equity directed toward underserved populations.

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Conflicts of Interest
AHT reported receiving nonfinancial support from Abbott Laboratories and grants from Gilead Sciences, Novo Nordisk, AstraZeneca, and Salix. AHT has served as a committee/advisor for Gilead, AbbVie, Novo Nordisk, and Madrigal. He also serves as Medical Director for Empath Medical. MM reported receiving grants from the Patient-Centered Outcomes Research Institute and the Kaleida Health Foundation. No other conflicts of interest were reported. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Abbreviations
AATOD: American Association for the Treatment of Opioid Dependence
DAA: direct-acting antiviral
HCV: hepatitis C virus
NASTAD: National Alliance of State & Territorial AIDS Directors
NYS: New York State
OTP: opioid treatment program
OUD: opioid use disorder
PCORI: Patient-Centered Outcomes Research Institute
SAMHSA: Substance Abuse and Mental Health Services Administration
STS: sociotechnical system

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Supplementary Files

Multimedia Appendixes

Untitled.
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