

# Patient Reaction to Telemedicine for Clinical Management of Hepatitis C Virus Integrated into an Opioid Treatment Program

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## Abstract

**Background and Introduction:** Virtual integration of hepatitis C virus (HCV) infection management within the opioid treatment program (OTP) through telemedicine may overcome limited treatment uptake encountered when patients are referred offsite. To evaluate the diffusion of telemedicine within the OTP, we conducted a pilot study to assess acceptance of and satisfaction with telemedicine among 45 HCV-infected opioid use disorder (OUD) patients on methadone.

**Materials and Methods:** We administered a modified 11-item telemedicine satisfaction questionnaire after the initial HCV telemedicine evaluation, when initiating HCV treatment, and 3 months post-HCV treatment completion. Among a patient subset, a semistructured interview further assessed issues of participant referral to the telemedicine program as well as convenience and confidentiality with the telemedicine encounters.

**Results:** Patients demonstrated their acceptance of telemedicine-based encounters by referral of additional participants. They highlighted the convenience of on-site treatment with a liver specialist through recognition of the benefit of “one-stop shopping.” They also expressed confidence in the privacy and confidentiality of telemedicine encounters.

**Discussion:** In this pilot study, telemedicine appears to be well accepted as a modality for HCV management among OUD patients on methadone. Virtual integration of medical

and behavioral therapy through telemedicine warrants further investigation for its use in this population.

**Conclusions:** In this pilot study, we found that a largely racial minority population of substance users grew to accept telemedicine over time with diminished privacy and confidentiality concerns. Telemedicine was well accepted within the OTP community as reflected by participant referral to the program.

**Keywords:** hepatitis C, opioid treatment programs, telemedicine, telemedicine satisfaction

## Introduction

Telemedicine removes geographical and temporal obstacles to healthcare delivery and can connect under-represented and vulnerable populations, such as persons with substance use disorders (PWSUDs), to medical specialists.<sup>1</sup> For example, patients with opioid use disorder (OUD) on methadone rarely receive treatment for hepatitis C virus (HCV) infection, despite an estimated 60% prevalence and increasing incidence.<sup>2,3</sup> Unfortunately, only one-third of OUD patients on methadone attend an initial appointment when referred offsite for a variety of reasons including stigmatization, discrimination, and concerns over privacy and confidentiality in conventional healthcare settings.<sup>4-8</sup> To overcome these limitations, integrated and colocated HCV and substance use treatment have been widely advocated.<sup>9-12</sup> Opioid therapy programs (OTPs) that dispense methadone therapeutically as a heroin replacement have rigorous attendance requirements from daily to biweekly. Consequently, OTPs may be ideal sites for integrated HCV and substance use treatment. Although physical integration has been difficult to achieve, recent technological advances may facilitate virtual integration through telemedicine. Telemedicine, however, has had limited application for integration of behavioral and medical therapy as was highlighted in a recent systematic review.<sup>13,14</sup>

Understanding the process of information technology implementation within a social system is crucial to its success. Roger's *Diffusion of Innovations*<sup>15-17</sup> describes how a new process or technology is adopted within a social system. Successful

implementation is judged on four main determinants: communication channels, characteristics of the adopters, the social system, and attributes of the innovation. Five user-perceived attributes are relative advantage, compatibility, complexity, trialability, and observability of the innovation. *Diffusion of Innovations* can be applied to understand telemedicine adoption in an OTP. In addition, substance users typically define their own social system with a “peer pipeline” to disseminate information.<sup>18</sup> They prefer to congregate in accepting and familiar locations, such as OTPs, to minimize the likelihood of discrimination and stigmatization. Understanding the evolution of telemedicine dissemination within the OTPs may assist in its establishment as a standard treatment delivery modality among difficult-to-engage and vulnerable populations. Therefore, we sought to assess OUD patients on methadone satisfaction with telemedicine for onsite HCV treatment.

**Materials and Methods**

We initially surveyed OUD patients on methadone at the participating site on their willingness to engage in HCV education and treatment,<sup>19</sup> and we subsequently offered onsite HCV-related education.<sup>20</sup> After an HCV evaluation through telemedicine, HCV medications were procured and were dispensed with methadone. We administered an 11-item telemedicine satisfaction questionnaire (TSQ)<sup>21</sup> at three time points during HCV treatment: at the first telemedicine evaluation, at HCV treatment initiation, and at 3 months post-treatment cessation. Telemedicine was conducted according to American Telemedicine Association practice guidelines.<sup>22</sup> Study participants were requested to sign institutional review board (IRB)-approved informed consents for study participation.

**SURVEY**

We assessed patient reaction to telemedicine through administration of a slightly modified previously validated instrument, the TSQ.<sup>21</sup> The TSQ assesses patient satisfaction with and preference for telemedicine as a treatment modality. It also assesses for technical difficulties in telemedicine conduct utilizing a response scale for all items ranging from strongly agree to strongly disagree (*Table 1*).<sup>21</sup> As racial and ethnic minorities have been shown to have confidentiality and privacy concerns related to internet transmission of health information,<sup>23</sup> we modified the TSQ to also assess security and comfort while receiving telemedicine services.

**SEMISTRUCTURED INTERVIEWS**

Study participants were invited to attend a semistructured interview. The semistructured interview occurred at the com-

pletion of telemedicine for all participants and after they had participated in several telemedicine encounters. The interview was conducted through videoconferencing, with a facilitator (A.R.) from Project Inform located in San Francisco interacting with the participants in a conference room within the OTPs. During the interview, we sought to verbally explore the TSQ responses and participants’ telemedicine experiences through an open dialogue about the telemedicine treatment program. We also specifically probed participant’s comfort level and willingness to refer others to the telemedicine program by inquiring: “How did you feel about seeing a doctor over the computer for hepatitis C treatment?” “What were your concerns as far as privacy and confidentiality?” and “Did you refer others to the program?” We choose to utilize a videoconferencing format to convey participants’ willingness to discuss their personal health issues in front of a camera and to permit communication of nonverbal cues, such as head nodding. All participants signed an informed consent form approved by the facility’s IRB. The participants who attended the interview (*n* = 14) were predominantly middle-aged African Americans.

**Table 1. Components of the Modified Telemedicine Satisfaction Questionnaire<sup>a</sup>**

ITEM NUMBER	TELEMEDICINE SATISFACTION STATEMENTS
1	I prefer to see the doctor through a computer rather than go to an offsite clinic.
2	I could see the doctor well.
3	I could hear the doctor well.
4	I did not have any problems communicating with the doctor through the computer.
5	I would recommend medical treatment through the computer to a friend.
6	Having a medical provider from START in the room during the interaction with the doctor through the computer helped me feel that I have a team of people caring for me.
7	I felt comfortable talking about my health over the computer because I was not worried about who would have access to my medical information.
8	I think the consultation through the computer made it easier and more convenient for me to see the doctor than going to a hospital or clinic for treatment.
9	Talking to the doctor over the computer is as satisfying as talking to him in person.
10	The computer consultation met my medical needs.
11	There were no interruptions during the visit.

<sup>a</sup>Modified from Yip et al.<sup>21</sup>

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**Table 2. Demographic and Social Variables of Study Participants**

VARIABLES	LEVEL	MEAN/ COUNT	SD/ PERCENTAGE
Age <sup>a</sup>	Years	56.3	10.0
Gender	Female	16	35.6
	Male	29	64.4
Race	African American	27	60.0
	White	5	11.1
	Others <sup>b</sup>	13	29.0
Ethnicity	Hispanic	11	24.4
	Non-Hispanic	34	75.6
Marital status <sup>c</sup>	Married	13	30.0
	Never married	19	43.2
	Divorced/separated/widowed	12	27.2
Employment status	Employed	3	6.7
	Unemployed, disabled	23	51.1
	Unemployed, not disabled	19	42.2
Highest education level obtained	At least some college or above	7	15.6
	GED obtained/high school graduate	20	44.4
	No GED/some high school	18	40.0

<sup>a</sup>Age is calculated as difference (in years) between date of birth and March 1, 2015.

<sup>b</sup>Others include Native Americans and individuals who responded to the questionnaire indicating other ethnicity.

<sup>c</sup>Data compiled from responses from 44 individuals.

GED, general education diploma; SD, standard deviation.

The interviews were videotaped, transcribed, and verified by study team members (HN-M, SSD) for accuracy.

**STATISTICAL ANALYSIS**

Statistical analysis was performed using R (www.r-project.org). Categorical and continuous variables were summarized as counts and percentages or means and standard deviations, respectively, as appropriate. We plotted patients’ responses to gender, race, and highest level education for each of the three TSQ administrations.

**Results**

A total of 45 participants received HCV treatment through telemedicine (Table 2). Most were male (64.4%), African

American (60%), and non-Hispanic (75.6%). The majority were unemployed and legally disabled (51.1%). Sixty percent had at least graduated from high school or obtained a general equivalency diploma. Many were never married (43.2%). Telemedicine satisfaction was obtained at three time points using the 11-item modified TSQ. In terms of TSQ completion, 100%, 69%, and 75% completed the initial, second, and third TSQ administrations, respectively.

At every time point, no technical (i.e., physician auditory or visualization) difficulties were noted, and all participants indicated that the telemedicine-based evaluation met their medical needs.

**OTP AS A COMMUNITY WITH A PEER COMMUNICATION NETWORK (TSQ Q5)**

OTP patients view themselves as a community, and information is passed on within their community when it is felt to be potentially beneficial. Participant statements supporting these attributes are illustrated (“A” in Table 3).

In response to the statement “I would recommend medical treatment via the computer to a friend” (TSQ question 5), at the first TSQ administration, 25% were undecided (Fig. 1A). By the third administration, almost all participants agreed or strongly agreed that they would refer colleagues for a telemedicine evaluation.

All individuals who had attended at least some college were willing to refer others for telemedicine evaluations at all time points (Fig. 1B). Individuals with lower education levels were less likely to refer at the first and second TSQ administrations, but almost all endorsed referral at the last time point. In terms of gender, women and races other than African Americans were more likely to refer at the first time point. Willingness to refer increased among males and African Americans to the point that almost all were willing to refer by the last time point (Fig. 1B).

**PATIENT PREFERENCE TO SEE PHYSICIAN ONSITE (TSQ Q1) AND EASE AND CONVENIENCE OF VIRTUAL MEDICAL EVALUATIONS (TSQ Q8)**

Semistructured interview responses were consistent with and supplemented TSQ responses in participant perception of the convenience of telemedicine-based HCV management. Descriptions of the telemedicine program related to patient preference, as well as the ease and convenience of virtual medical evaluations (“B” in Table 3), align with TSQ results for questions 1 and 8 (Figs. 2A and 3A) after the third administration.

In response to the statement, “I prefer to see the doctor through a computer rather than go to an offsite clinic” (TSQ question 1), at the initial time point, most patients were

**Table 3. Association Between Patient Quotes and Telemedicine Satisfaction Questionnaire Items and Supporting Evidence**

QUOTE	EVIDENCE
A: TSQ Q5: "I would recommend medical treatment through the computer to a friend"	
"...We are a community amongst ourselves. We talk to one another. The one thing about addicts is, when the good thing is out, we pass the word. And that's what we did."	Evidence of the methadone treatment program as a community with peer communication networks resulting in referrals to participate in telemedicine.
"I referred anyone that wanted to listen."	
"They (a study participant) referred me, and every other patient I felt that I could talk to and find out if they have the infection, then I strongly advised them to seek treatment and they can get treatment right here at the clinic."	
B: TSQ Q1 "I Prefer to See the Doctor Through a Computer Rather Than Go to an Offsite Clinic," and TSQ Q8: "I Think the Consultation Via the Computer Made It Easier and More Convenient for Me to See the Doctor Than Going to a Hospital or Clinic for Treatment"	
"One-stop shopping"	Patient preference to see physician onsite and ease and convenience of virtual medical evaluations.
"- the beauty of it is to bring the treatment right there to them. Imagine if they had to go far away way out somewhere, but you can get your treatment right here, where you get your medication and do your other business, I mean how much easier can you have it?"	
C: TSQ Q7: "I Felt Comfortable Talking About My Health Over the Computer Because I Was Not Worried About Who Would Have Access to My Medical Information"	
"Well honestly I wasn't too worried about the privacy issue-. The privacy issue didn't really bother me much." Another participant stated "I felt safe. It's better than going into some of these doctors' offices, I felt safer than that. I felt better in your TV, talking to you on the TV, than I did with them."	Privacy and confidentiality
"He made the whole thing easy, relaxing, informative. I got a lot out of it.... And it was easy, it was extremely easy and I felt comfortable."	
"It was real-time. It was real-time, so it didn't seem like it was over the computer to me, it was real time. It wasn't like over a teletyper or over a radio, you could actually tell that the person was there so it didn't make any difference to me. It seemed better to me because you knew you were speaking to a specialist, instead of being referred to somebody."	

ambivalent. By the conclusion of the follow-up period, the vast majority of patients either "agreed" or "strongly agreed" with the statement (Fig. 2A).

As mentioned, more educated participants were generally initially more open to the intervention, whereas those without a high school diploma or its equivalent were substantially

more skeptical (Fig. 2B). By the third TSQ administration, all participants generally preferred onsite treatment regardless of educational status. With regard to race, African Americans were more accepting of telemedicine than other races at the first TSQ administration. At the last administration, neither race nor gender differences were noted with regard to preference of telemedicine in comparison with offsite referral.

The convenience of onsite HCV treatment was strongly acknowledged on the initial and subsequent TSQ responses. No gender, race, or education level differences were noted with regard to the convenience of telemedicine (Fig. 3B).

**ISSUES OF PRIVACY AND CONFIDENTIALITY (TSQ Q7)**

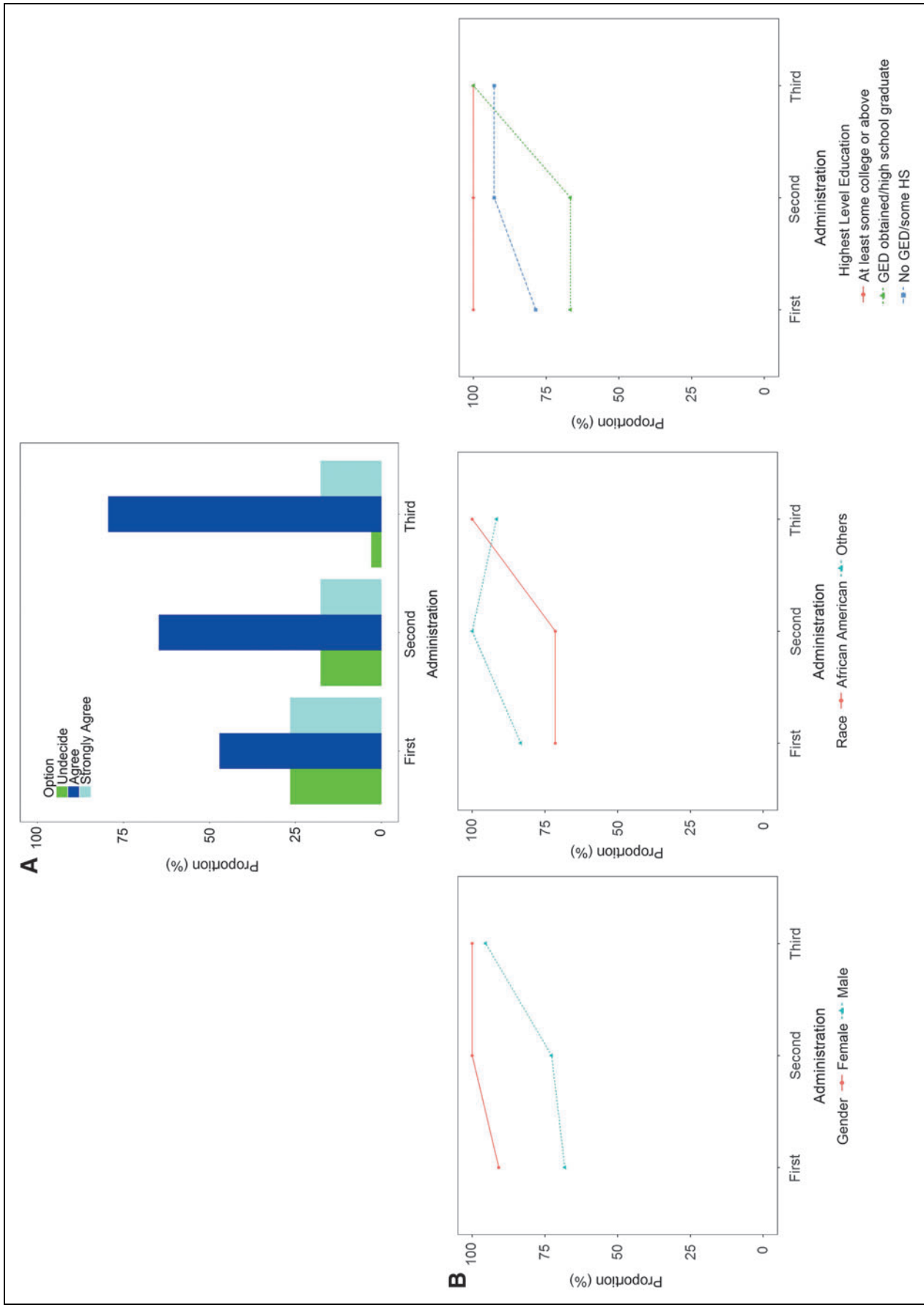
Literature has described African American patient's hesitation to disclose medical information over the internet.<sup>23</sup> As our participants were largely African American, we addressed privacy and confidentiality concerns regarding internet transmission of medical information ("C" in Table 3).

At the first TSQ administration, ~25% of respondents expressed concerns about privacy of telemedicine-based medical evaluations (Fig. 4A). However, these concerns progressively diminished as treatment progressed. Little difference in concern existed between genders and races with regard to internet transmission of medical information. Participants with at least some higher education were initially more skeptical and showed the highest change in acceptance by the third TSQ administration.

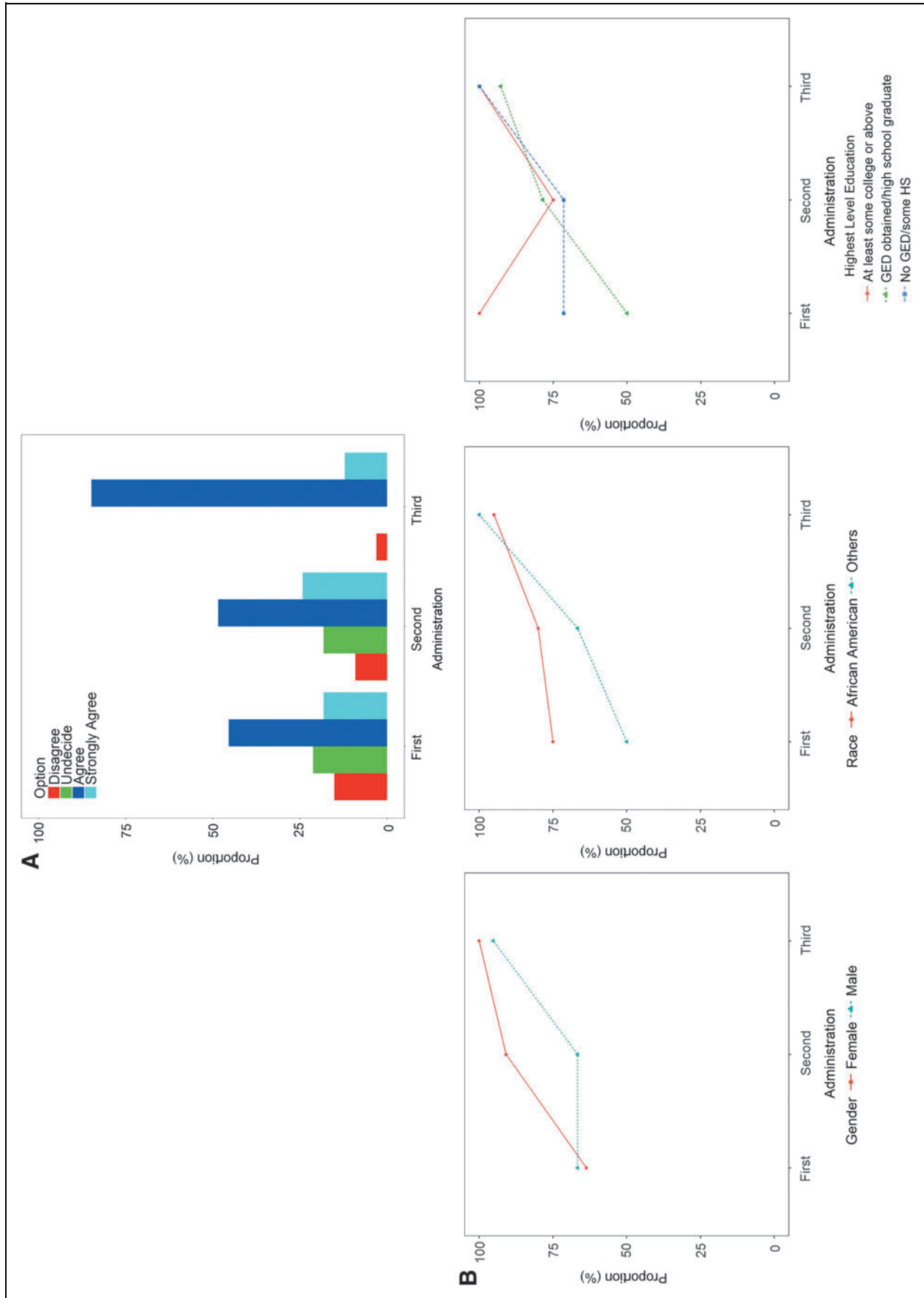
**Discussion**

We evaluated acceptance (referral of others) and satisfaction (preference) with telemedicine-based HCV care among patients in an OTP. Despite initial skepticism regarding telemedicine as a method of healthcare delivery, participants gradually became more comfortable with the modality as treatment progressed. We found that familiarity with telemedicine improved patient preference and diminished privacy concerns. The preference for and convenience of "one-stop shopping" afforded by telemedicine interactions, combined with the absence of privacy or confidentiality concerns, led to additional patient referrals for telemedicine-based HCV care. Innovative HCV treatment approaches are urgently needed in this population given the high HCV prevalence and incidence.

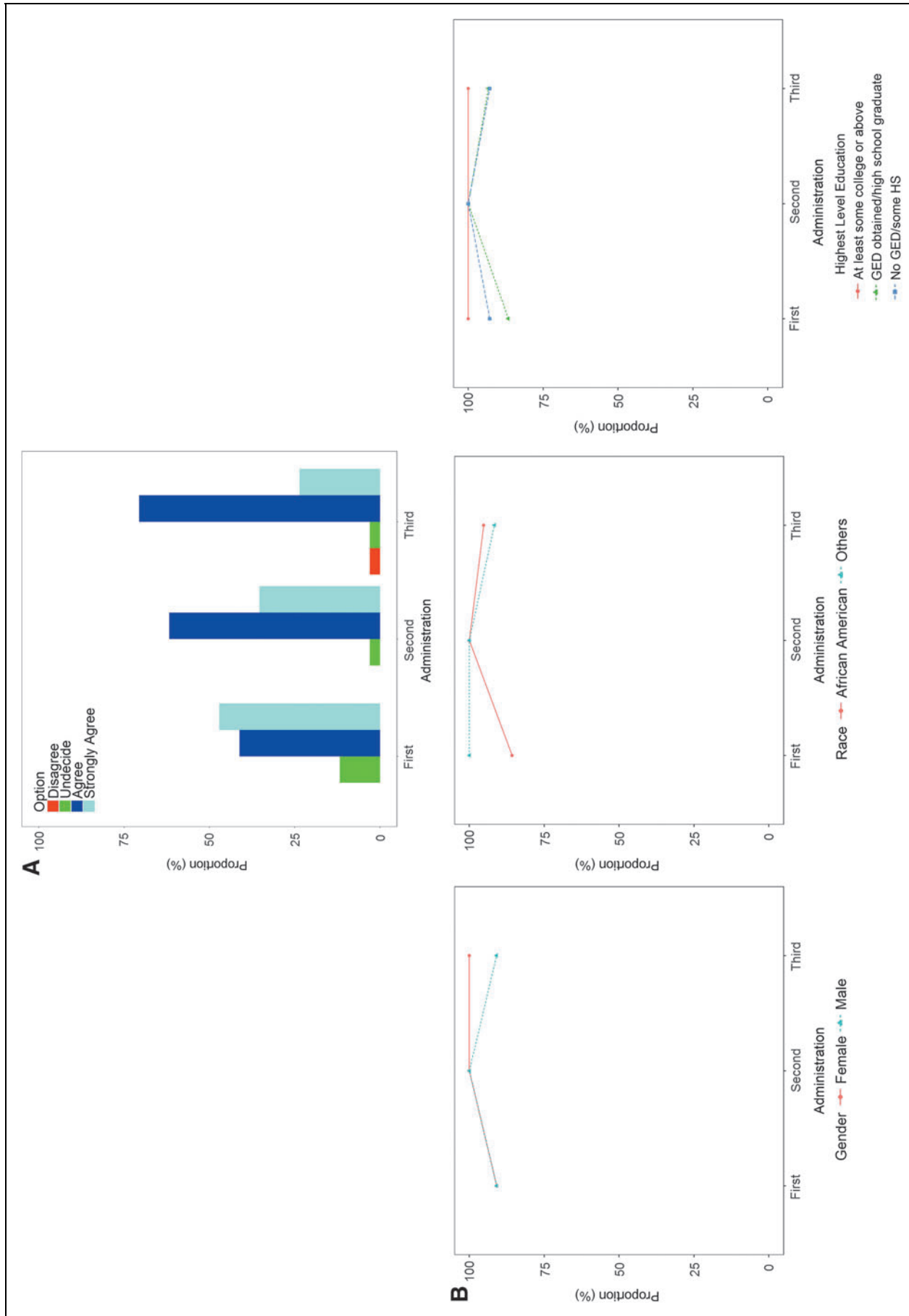
Evidence of positive impact of telemedicine within the OTPs, according to *Diffusion of Innovations*, is illustrated in Table 4. OUD patients on methadone consider themselves a community with their own communications network. They perceived the relative advantage of telemedicine and appreciated its compatibility with the environment within the OTPs that provide onsite primary care and HIV services. The



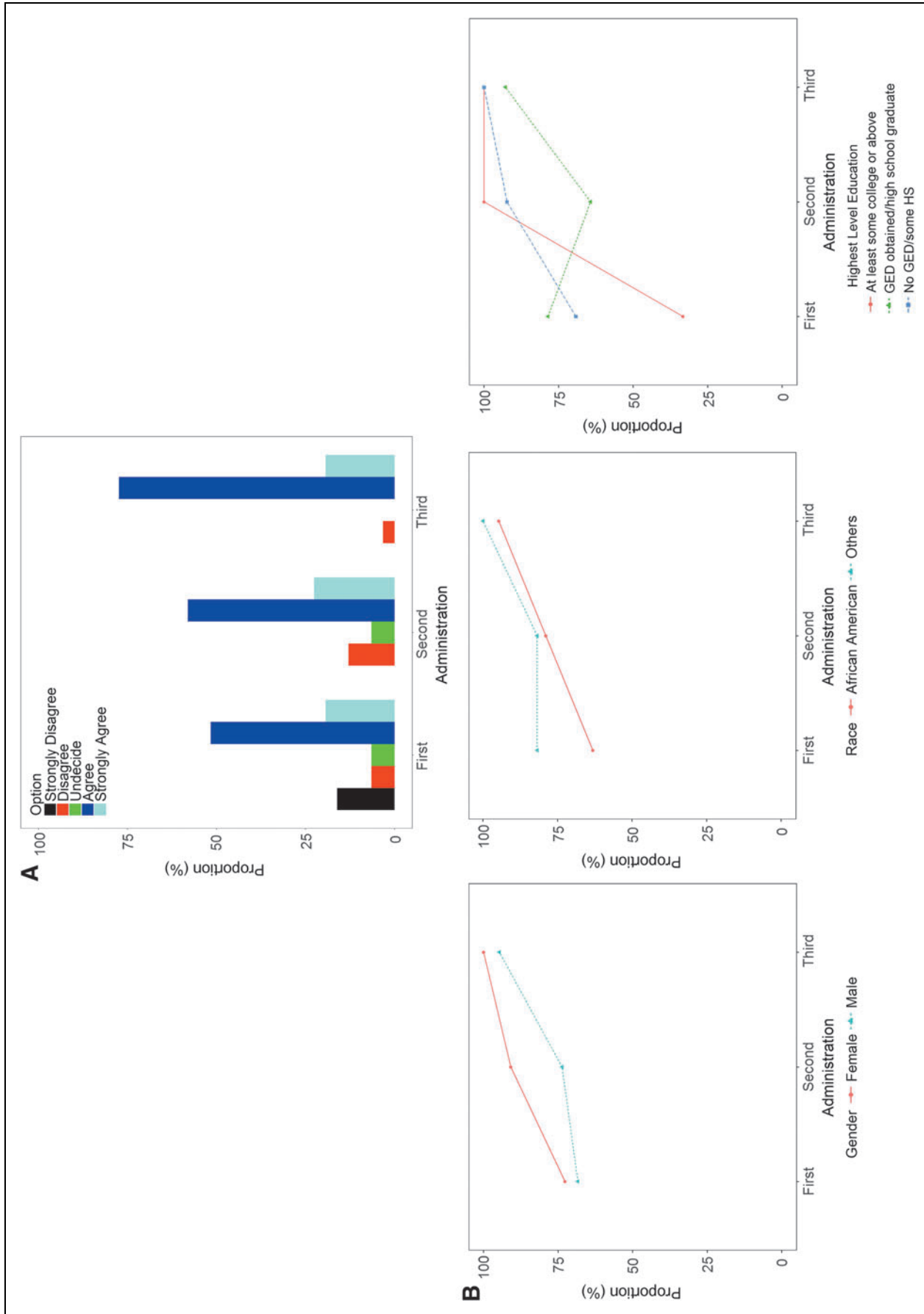
**Fig. 1.** Percentage of responses at three separate administrations to Telemedicine Satisfaction Questionnaire (TSQ Q5): "I would recommend medical treatment via the computer to a friend." (A) Overall responses and (B) trend analysis for gender, race, and educational level responses associated with TSQ Q5. GED, general education diploma.



**Fig. 2.** Percentage of responses at three separate administrations to Telemedicine Satisfaction Questionnaire (TSQ Q1): “I prefer to see the doctor through a computer rather than go to an offsite clinic.” (A) Overall responses and (B) trend analysis for gender, race, and educational level responses associated with TSQ Q1. GED, general education diploma.



**Fig. 3.** Percentage of responses at three separate administrations to Telemedicine Satisfaction Questionnaire (TSQ Q8): "I think the consultation via the computer made it easier and more convenient for me to see the doctor than going to a hospital or clinic for treatment." (A) Overall responses and (B) trend analysis for gender, race, and educational level responses associated with TSQ Q8. GED, general education diploma.



**Fig. 4.** Percentage of responses at three separate administrations to Telemedicine Satisfaction Questionnaire (TSQ Q7): “I felt comfortable talking about my health over the computer because I was not worried about who would have access to my medical information.” (A) Overall responses and (B) trend analysis for gender, race, and educational level responses associated with TSQ Q7. GED, general education diploma.



**Table 4. Diffusion of Innovations Theory Applied to Telemedicine Implementation in an Opioid Treatment Program**

ATTRIBUTE		DEFINITION	RELEVANCE TO CURRENT PROJECT	EVIDENCE
Social system		Interconnected units working collaboratively toward common goal.	OTPs viewed as a social system.	Participants view themselves as a community.
Communication channel		Method of information spread; user ability to perceive usefulness	Peer pipeline	Peer communication network for referrals for telemedicine participation
Attributes of innovation	Relative advantage	Perception of benefit or improvement over existing technology	Participants prefer telemedicine to offsite referral	Preference and convenience of "one-stop" shopping.
	Compatibility	Consistent with existing technical and social environment	Onsite HCV care is consistent with the mission of the OTP	Primary and HIV care are offered by the OTP.
	Complexity	Perception of difficulty of implementation, use or understanding	Colocated and integrated HCV and substance use treatment enhances adherence	Prefer "one-stop shopping"; facilitated by OTP staff member as telepresenter
	Trialability	Ability to try without total commitment and with minimal investment	Frequent attendance requirements at OTPs	Research participation was voluntary
	Observability	Visible benefits to potential adopters	Hepatitis C virus eradication through telemedicine evaluations	No subject discontinued participation

Table illustrates each attribute and its definition of telemedicine implementation in the opioid treatment program through the lens of *Diffusion of Innovations*. We also illustrate the relevance of and evidence for each attribute based on data obtained from the telemedicine satisfaction questionnaires and the semistructured interviews. OTP, opioid substitution therapy program; HCV, hepatitis C virus. Adopted from Refs.<sup>15,16</sup>

intervention was perceived as minimally complex as setup and telepresenting were performed by the OTP's staff (A.M.) and advanced practitioner (P.A.). In terms of trialability, participants could test the system without long-term obligation, although no participant discontinued prematurely due to the telemedicine-based evaluations. The intervention's outcome, viral eradication, was also imminently observable to participants. In terms of the characteristics of the adopters, we likely enrolled the innovators and early adopters who comprise 16% of the population in a social system.<sup>15</sup> We estimate that we enrolled ~18% of eligible participants from the OTP population based on clinic size and the number of HCV antibody-positive participants.

The majority of the study participants were from minority groups, either of African American or of Hispanic ancestry. Prior investigation has shown that African Americans tend to be more suspicious and cautious than Hispanics about internet transmission of sensitive medical data.<sup>23</sup> According to our findings, African American participants demonstrated a substantial positive shift in their reaction to medical evaluation through telemedicine. They initially manifested ambivalence toward telemedicine that subsequently shifted toward strong endorsement, as indicated by referral of others for evaluation. Similarly, those who reported having completed some high school or high school equivalency displayed increased willingness to refer other patients to the program. In contrast, we noted that those

with the most education showed the greatest change in comfort in discussing medical information through the computer, that is, a high degree of initial skepticism that diminished substantially by the last questionnaire administration.

Studies of healthcare delivery through telemedicine have found that it is similar, if not equal, to an in-person visit.<sup>24-27</sup> A recent systematic review identified telemedicine's ability to integrate treatment of medical and behavioral conditions as an area for additional research.<sup>14</sup> Telemedicine has also been shown to increase linkage-to-care and to reduce healthcare costs.<sup>28</sup> Because of the high incidence and prevalence of HCV infection among PWSUDs and the low incidence of treatment uptake, innovative methods are needed to engage this population into medical care.

Our study population and the OTP's ability to implement telemedicine may not be fully representative of other OTPs; hence, generalizability of the study findings awaits confirmation. As only 14 individuals participated in the semistructured interviews, they may not reflect the opinions of all study participants. Furthermore, individuals who had negative opinions of telemedicine may have been less likely to attend. Our results illustrate that a small percentage of study participants had negative impressions of telemedicine that persisted throughout the treatment course. An additional limitation is missing response data from a minority of the participants.

We anticipate that the effectiveness of telemedicine as a method to integrate treatment of clinical and behavioral conditions, as demonstrated in this pilot study, has the potential to change treatment approaches for PWSUDs. The OTP is a community for PWSUDs wherein their trust of the staff results in less perceived stigmatization than is typically encountered in other healthcare settings. The ability to colocate in the OTP treatment for all medical conditions affecting PWSUD has the potential to develop the venue into the medical home for these individuals. Similarly, telehealth approaches offer opportunities to expand healthcare services to other types of substance use treatment facilities. The generalizability of telemedicine treatment for HCV to a wide range of OTPs administered by hospitals, community-based entities, and academic health centers at 12 sites throughout New York State for a 5-year period is currently under investigation ([www.cdnetwork.org/teamc](http://www.cdnetwork.org/teamc)).

We assessed acceptance and utilization of telemedicine by a largely racial minority population of substance users. We found that telemedicine acceptance improved over time with participants citing the preference and convenience of “one-stop shopping.” Study participants utilized a peer communication network existent in the OTP for additional referrals for telemedicine. Further investigation regarding dissemination of information and use of the peer network to engage the early majority and late majority<sup>14</sup> may be beneficial. Ultimately, patient acceptance will be critical for telemedicine to become an established standard method for treatment of HCV among PWSUDs.

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### Disclosure Statement

A.H.T. has served as a speaker, a consultant, and an advisory board member for Abbott Laboratories, Merck, and

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