

No Patient Left Behind: A Novel Paradigm to Fulfill Hepatitis C Virus Treatment for Rural Patients

Mirinda Ann Gormley,^{1,2,3,0} Phillip Moschella,^{1,2,3,0} Susan Cordero-Romero,^{1,4,0} Wesley R. Wampler,^{5,0} Marie Allison,⁶ Katiey Kitzmiller,⁶ Luke Estes,⁵ Moonseong Heo,^{4,®} Alain H. Litwin,^{3,6,7,®} and Prerana Roth^{3,6,7,®}

¹Department of Emergency Medicine, Prisma Health Upstate, Greenville, South Carolina, USA, ²Department of Emergency Medicine, School of Medicine–Greenville, University of South Carolina, Greenville, South Carolina, USA, ³School of Health Research, Clemson University, Clemson, South Carolina, USA, ⁴Department of Public Health Sciences, Clemson University, Clemson, South Carolina, USA, ⁵Department of Ambulance Services, Prisma Health Upstate, Greenville, South Carolina, USA, ⁶Department of Internal Medicine, Prisma Health Upstate, Greenville, South Carolina, USA, and ⁷Department of Internal Medicine, School of Medicine–Greenville, University of South Carolina, Greenville, South Carolina, USA

Background. This study evaluates a novel multidisciplinary program providing expanded access to hepatitis C virus (HCV) treatment for rural Appalachian patients in South Carolina. This program identified patients via an opt-out emergency department screening program, and it aimed to achieve HCV cure by using community paramedics (CPs) to link and monitor patients from treatment initiation through 12-week sustained virologic response (SVR).

Methods. Patients aged \geq 18 years who were HCV RNA positive were eligible for enrollment if they failed to appear for a scheduled HCV appointment or reported barriers to accessing office-based treatment. CPs provided home visits (initial and 4, 12, and 24 weeks) using a mobile Wi-Fi hotspot to support telemedicine appointments (compliant with the Health Insurance Portability and Accountability Act) and perform focused physical assessments, venipuncture, and coordinated home delivery of medications. Statistics described participant characteristics, prevalence of SVR, and patient satisfaction results at 12 weeks posttreatment.

Results. Thirty-four patients were eligible for SVR laboratory tests by 31 August 2023; the majority were male (61.7%) and White (64.7%) with an average age of 56 years (SD, 11.7). Twenty-eight (82.4%) completed treatment and achieved 12-week SVR. Six (17.6%) were lost to follow-up. Two-thirds strongly agreed that they were satisfied with the overall care that they received, and half strongly agreed that their overall health had improved.

Conclusions. This CP-augmented treatment program demonstrated success curing HCV for rural patients who lacked access to office-based treatment. Other health care systems may consider this novel delivery model to treat hard-to-reach individuals who are HCV positive.

Keywords. community paramedicine; HCV; HCV treatment; rural; telemedicine.

Approximately 2.4 million Americans are currently estimated to be living with hepatitis C virus (HCV) [1]. Of those, nearly half do not know that they are infected, increasing their risk for developing cirrhosis and liver cancer [2] and the likelihood that they could unknowingly spread this potentially life-threatening disease to others [1, 2]. The current rates of acute and chronic HCV infection are rising across the United States and specifically in South Carolina. In 2018 alone, South Carolina saw 493% and 74% increases in acute and chronic HCV infection, respectively, with the highest rate clustered in counties comprising the

the state [3]. These rural counties pose unique difficulties accessing HCV treatment secondary to economic, logistic, and geographic barriers. Barriers such as these necessitate the creation of innovative interventions to increase access to HCV screening, linkage to care, and treatment delivery [4]. The emergency department (ED) is an ideal location for iden-

southernmost parts of Appalachia in the northwest corner of

tification of HCV among vulnerable populations lacking access to health care resources [5]. Yet, while many EDs have been successful in identification through implementation of universal opt-out screening programs, they lag in linkage to treatment, as many patients utilizing the ED as their only means of health care access still struggle with access to outpatient HCV treatment [6]. This is exemplified in the fairly low linkage-to-care rates for individuals identified from the ED who are HCV positive, which range between 22.6% and 43.0% [7]. Patients may fail linkage to office-based HCV treatment for a variety of reasons, such as high costs, limited health care resources, or lack of awareness [4, 8]. Even when treatment is available, it is typically available only at physically distant treatment facilities [4, 8, 9].

Telemedicine models have greatly increased access to HCV treatment for underserved patients, thus reducing urban

Received 01 December 2023; editorial decision 02 April 2024; accepted 10 April 2024; published online 26 April 2024

Correspondence: Mirinda Ann Gormley, PhD, MSPH, Department of Emergency Medicine, Prisma Health Upstate, 701 Grove Rd, Greenville, SC 29605 (mirinda.gormley2@prismahealth.org). **Open Forum Infectious Diseases**[®]

[©] The Author(s) 2024. Published by Oxford University Press on behalf of Infectious Diseases Society of America. This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs licence (https://creativecommons. org/licenses/by-nc-nd/4.0/), which permits non-commercial reproduction and distribution of the work, in any medium, provided the original work is not altered or transformed in any way, and that the work is properly cited. For commercial re-use, please contact reprints@oup.com for reprints and translation rights for reprints. All other permissions can be obtained through our RightsLink service via the Permissions link on the article page on our site-for further information please contact journals.permissions@oup.com. https://doi.org/10.1093/ofid/ofae206

disparities in access [6, 10]. Patients receiving care through telemedicine models often achieve similar clinical outcomes to their nontelemedicine counterparts [11]. These models can also be used to target vulnerable populations, such as people who inject drugs, through the incorporation of telemedicine HCV treatment into opioid treatment programs [12–16]. Yet, these may not be a viable solution for all. Many may not have a phone capable of performing a telemedicine visit, and rural economically depressed areas may lack access to the necessary internet bandwidth to support virtual visits. Even if a telehealth visit is possible, the patient is usually still required to attend an in-person visit to obtain necessary bloodwork and/or a physical examination.

While many multidisciplinary teams have formed to connect hard-to-reach patients who are HCV positive to HCV treatment, few have successfully created a model that allows for all activities to take place within the patient's home. A new health care resource that shows promise to accomplish this with respect to overall logistics and cost is community paramedics (CPs). CPs are specially trained paramedics performing in a nonemergent role to help patients access available health care resources [17]. Traditionally CPs have been shown to decrease hospital readmissions and improve overall health outcomes among patients with a variety of chronic diseases [17, 18]. Although CPs often utilize telemedicine interventions to assist with the treatment of chronic diseases [19, 20], to our knowledge, no study has yet investigated the effectiveness of a collaborative intervention between CPs and infectious disease (ID) physicians to provide HCV treatment.

This study describes the pilot trial of a novel delivery method of HCV treatment for rural patients in South Carolina. The primary objective was to assess the effectiveness of this intervention on achieving sustained virologic response (SVR) and patient satisfaction during the first 2 years of implementation.

METHODS

Program Setting

Since 1 July 2019, several EDs within a large regional health care system in South Carolina implemented an opt-out program to screen patients for HCV and HIV and link those screening positive to appropriate treatment. To date, this program has screened 24 418 individuals, identifying 2139 (8.8%) as HCV RNA positive. Following a positive diagnosis of HIV or HCV, a trained study coordinator or nurse informs the patient of the HCV diagnosis, provides education on various treatment options to the nearest location, and performs a survey of various social determinants of health. This survey queries potential barriers: transportation, insurance or financial limitations, housing stability, and secure food in the home. The study coordinator then attempts to schedule a follow-up appointment for the patient to attend office-based HCV treatment at the nearest location. Anecdotal interviews with several patients previously unlinked to treatment revealed that they typically lacked the means to attend office-based treatment due to a lack of personal and/or public transportation. On 1 July 2021, an emergency medicine physician and an ID physician collaborated with the Prisma Health Mobile Integrated Healthcare program to create the Community Paramedic HCV iLink (CP HCV iLink) program, aimed at delivering HCV treatment to rural and underserved patients within the community.

Participants

Patients aged \geq 18 years were eligible for CP HCV iLink if they screened positive for HCV RNA from the ED and reported that they would be unable to attend office-based HCV treatment. Patients had to have access to a telephone to receive communication from the study team. Patients were also eligible for enrollment if they were scheduled for office-based HCV treatment and failed to attend. On average, all identified patients were able to receive an index appointment within 30 days of referral to this program. Individuals who were <18 years old, those with decompensated liver disease or advanced cirrhosis, and those with HIV or hepatitis B coinfection were excluded from participation.

Patient Consent Statement

The CP HCV iLink study was reviewed by the Prisma Health Institutional Review Board and approved as exempt (1857789-1). As a retrospective cohort study, consent was waived for all patients involved in the retrospective analysis of the 12-week SVR (SVR-12). Patients were provided with informed consent to participate in the patient satisfaction survey. Only patients who consented participated in the survey.

Study Team and Program Summary

CP HCV iLink is a multidisciplinary team composed of an ID physician, an emergency medicine physician, an epidemiologist, a biostatistician, 2 study coordinators, 1 nurse, and 1 CP. The emergency medicine physician and study coordinators identified the patients who were HCV positive in the ED or within the health care system. The study coordinators reached out to patients to schedule all appointments and worked with the nurse and the CP to ensure that all necessary laboratory tests were collected and processed. The study coordinators, nurse, and CP also ensured that the medications were filled and provided to the patients. The ID physician and the CP directly interacted with patients during each appointment. The epidemiologist and biostatistician reviewed the results and performed quality assessment and quality improvement for program evaluation.

Enrollment. Study coordinators asked the patients if they would like to participate in the CP HCV iLink program and then scheduled virtual appointments in the electronic health care records via EPIC software. The study coordinator or CP conducted a follow-up phone call within 48 hours of all scheduled appointments to ensure that each patient would be home at the time of the visit.

Index Visit. A CP arrived to the patient's home and initiated a call with the ID physician via video conferencing software (VidyoConnect) that is HIPAA compliant (Health Insurance Portability and Accountability Act). Internet access by line or wireless is sparce in these counties and often unable to support a video conferencing call. Oconee County in particular is mountainous with transport from the local hospital to the level 1 trauma center occurring by helicopter. As such, CPs utilized a mobile Wi-Fi hotspot installed in their vehicle to boost the wireless signal. The CP assessed the patient's vital signs and assisted the video-linked physician by performing a guided and targeted physical examination. The CP assessed and documented all patient medications and performed venipuncture, utilizing ultrasound-guided techniques as necessary for laboratory work. Laboratory tests were ordered per individual requirements but typically included the following: HIV-1 and HIV-2 antigen/antibody combination screen, hepatitis B core antibody, surface antigen and surface antibody, hepatitis A antibody, hepatitis C genotype, comprehensive metabolic panel, complete blood count with differential, prothrombin time/international normalized ratio, and FibroSure. Following laboratory tests, the ID physician explained the process for HCV treatment with the patient and provided the patient with the nurse's contact information in case of any questions. After the index visit, the CP delivered laboratory specimens to the nearest Prisma Health facility. Patients received a bill for the index visit as a telemedicine call with the ID provider. No patient was denied HCV treatment due to an inability to pay the copay. Those who lacked insurance or were unable to pay the copay were offered hospital assistance.

Medication. Medication delivery was determined by patient insurance status. Insured patients completed a prior authorization form, while uninsured patients completed hospital sponsorship paperwork provided by the CP and an application specific to the type of medication they received. The nurse completed patient assistance applications through iAssist and completed prior authorizations for specialty pharmacies that were outside of the Prisma Health network. The nurse also assisted with copay cards and helped obtain sponsorships when medication copays were >\$7000. Receipt of medications was coordinated between the patient and the pharmacy, which typically mailed the medication to patients' homes via United Parcel Service or FedEx. Mavyret (glecaprevir/pibrentasvir) was delivered once a month for 8 weeks of treatment, and Epclusa (sofosbuvir/velpatasvir) was delivered once a month for 12 weeks of treatment. A few patients had medications delivered by the CP, as they were unable to receive medications through the mail due to lack of a permanent mailing address.

Follow-up Visits. Patients received a follow-up visit from the CP at 4, 12, and 24 weeks following treatment initiation. Third-party payers did not require week 2 HCV RNA declines to document efficacy, following the guidelines set forth by the

Infectious Diseases Society of America and the American Association for the Study of Liver Diseases [21]. During each follow-up, the CP repeated the physical examination and obtained laboratory test results for HCV RNA quantitation and the comprehensive metabolic panel. The CP discussed the patient's most recent laboratory results, asked about treatment and potential side effects, and helped resolve any issues concerning medication. During each follow-up, the CP also helped procure resources for other necessary health care services. The process for receiving resources was unstandardized and individualized according to each patient's requests and needs.

Data Collection

Results of the patient's physical examination, bloodwork, and survey responses were recorded by the study coordinators using REDCap (Research Electronic Data Capture) hosted by Prisma Health [22, 23]. Data regarding the proportion of individuals in poverty per zip code were compiled from the US Census Bureau American Community Survey for 2022 [24]. Poverty was defined by money income thresholds that vary by family size and composition [25]. This article reports the proportion meeting criteria for poverty in each zip code. The average number of miles from the nearest treatment center is defined as the distance between the patient's home and the nearest outpatient HCV treatment location.

Patient Satisfaction Survey. During the 24-week visit, patients were asked to participate in a voluntary satisfaction survey. The survey included 10 questions: 6 quantitative and 4 open-ended/qualitative (Supplementary Appendix 1).

Outcomes. The primary outcome for this study was SVR-12. Additional outcomes included treatment initiation and completion, as well as reinfection, defined as that between the 12-and 24-week SVR tests.

Data Analysis

Statistics described overall patient demographics. To be included in the SVR-12 calculation, a patient had to receive an initial appointment and a prescription for a medication. Any patient who was qualified to have SVR-12 laboratory tests but did not receive them was considered a treatment failure. Qualitative data from patient satisfaction surveys were summarized into a table. Data analyses were conducted with SAS Enterprise (version 8.3; SAS Institute).

RESULTS

Study Population

A total of 52 patients were enrolled during the initial 2-year study period (1 July 2021–30 June 2023). Two (3.8%) were scheduled for an initial appointment but did not attend. One patient (1.9%) attended the initial appointment and was prescribed medication but failed to receive the medication due

to not filing the financial aid paperwork. Attempts to reach all 3 patients were unsuccessful, and they were considered lost to follow-up. The remaining 49 (94.2%) received an initial appointment and filled a prescription for Epclusa or Mavyret. As this was a rolling enrollment in real time, only 34 (65.4%) individuals were eligible for SVR-12 by 31 August 2023. The remaining 15 were in various stages of active treatment but not yet eligible for SVR laboratory tests by 31 August 2023.

The 34 individuals eligible for SVR laboratory tests were predominantly male (61.7%), with 64.7% White, 32.4% Black, and 3.0% Hispanic and with an average age of 56 years (SD, 11.7; Table 1). The majority utilized Medicaid (38.2%) or Medicare (35.3%), with 17.6% reporting no insurance or hospital sponsorship. Distance to the nearest outpatient treatment facility from a patient's home ranged from 2.7 to 70.6 miles, with a median 20.4 miles. Approximately one-third of the population (32.3%) lived in an area where the proportion living in poverty was >20%; 38.2% lived in an area where the proportion living in poverty was between 10.9% and 19.4%; and the remaining 29.4% of patients lived in an area where the proportion living in poverty was <9.1% (Supplementary Appendix 2). Patients received either Epclusa (88.2%) or Mavyret (11.8%).

SVR Results

Of 34 individuals eligible for SVR-12 laboratory tests by 31 August 2023, 28 (82.4%) were cured and 6 (17.6%) were lost to follow-up. During follow-up, only 1 (2.9%) case of

Table 1. Demographic and Clinical Characteristics of the Community Paramedic HCV iLink Population (n = 34)

Variable	No. (%)
Age, y, mean (SD)	56 (12.2)
Gender	
Male	21 (61.7)
Female	14 (38.3)
Race	
White	22 (64.7)
Black	11 (32.4)
Hispanic	1 (3.0)
Postprogram insurance status	
Medicaid	13 (38.2)
Medicare	12 (35.3)
Private	3 (8.8)
Self-pay/hospital sponsorship	6 (17.6)
Medication	
Mavyret	4 (11.8)
Epclusa	30 (88.2)
SVR status	
Cured	28 (82.4)
Lost to follow-up	6 (17.6)
Unable to contact	3 (8.8)
Moved out of state	1 (2.9)
Refused participation	2 (5.9)

Abbreviations: HCV, hepatitis C virus; SVR, sustained virologic response

reinfection was discovered, and this person was immediately readmitted into the program.

Dropout

Of the 6 patients (17.6%) who would have been eligible for SVR-12 laboratory tests and were lost to follow-up, 5 were lost after receiving their first course of medications. One received 4-week follow-up laboratory tests and had undetectable virus at 4 weeks but was then unable to be reached. Of the 5 remaining, 2 were successfully contacted but refused to continue participation in the study; 2 were unable to be contacted by telephone or mail; and 1 was confirmed to have moved out of state.

Patient Satisfaction

Of every 3 patients, 2 strongly agreed that they were satisfied with the overall care that they received, and half strongly agreed that their overall health had improved (Table 2). All but 1 strongly agreed/agreed that they received an adequate number of visits for their HCV treatment, and all but 1 strongly agreed/ agreed that the CP staff was caring and empathetic throughout each encounter. Nearly 3 of every 4 patients strongly agreed that they felt more informed of their medical condition and

Table 2. Patient Satisfaction With the Community Paramedic HCV iLink Program (n = 18)

Question	No. (%)
I am satisfied with the overall care I received	
Strongly agree	12 (66.7)
Agree	4 (22.2)
Neutral/disagree/strongly disagree	2 (11.1)
I feel that my overall health has improved	
Strongly agree	9 (50.0)
Agree	6 (33.3)
Neutral/disagree/strongly disagree	3 (16.7)
I feel the number of visits I received was adequate to address my \ensuremath{HCV} treatment	
Strongly agree	9 (50.0)
Agree	8 (44.4)
Neutral/disagree/strongly disagree	1 (0.6)
I feel the CP staff were caring and empathetic throughout each encounter	
Strongly agree	13 (72.2)
Agree	4 (22.2)
Neutral/disagree/strongly disagree	1 (0.6)
I feel I am more informed of my medical condition and diagnoses because of my interactions with the CP program	
Strongly agree	13 (72.2)
Agree	4 (22.2)
Neutral/disagree/strongly disagree	1 (0.6)
I feel I am more able and comfortable with addressing and improving my overall health	
Strongly agree	10 (56.0)
Agree	6 (33.3)
Neutral/disagree/strongly disagree	2 (11.1)

Abbreviations: CP, community paramedic; HCV, hepatitis C virus.

diagnosis because of their interactions with the CP program, and all but 2 strongly agreed/agreed that they felt more able and comfortable addressing and improving their overall health.

Patient Recommendations for Future Implementation

The majority of individuals (94.4%) listed at least 1 benefit to participating in the CP HCV iLink program (Table 3). Participants most frequently reported that they improved their health (35.6%) or felt positive about treating their HCV (35.6%). All but 2 stated that there were no barriers that kept them from participating. The only mentioned barriers were transportation and lost medication. Only 1 made a recommendation for improvement, asking that the CP HCV iLink program improve medication procurement.

DISCUSSION

A total of 52 patients were enrolled to participate within the first 2 years of this pilot study. Forty-nine patients had their first CP-augmented appointment and were prescribed medication. As of 31 August 2023, 28 patients who were HCV positive were cured. These patients reside in the economically poor Appalachian counties of rural South Carolina in the northwest corner of the state.

The rural participants of this study previously faced multiple barriers to receiving HCV care, despite living in counties with

Table 3. Patient Recommendations for Future Implementation of the Community Paramedic HCV iLink Program (n = 18)

Question	No. (%)
What were the benefits of participating in the CP HCV iLink Program?	
Program came to my home	5 (29.4)
Feel I overall improved my health	6 (35.3)
Feel positive about treating my HCV	6 (35.3)
Feel comfortable with my providers	3 (17.6)
What were the barriers that kept you from participating?	
None	15 (88.2)
Transportation	1 (5.9)
Lost medication	1 (5.9)
Do you need treatment for any other medical conditions that you feel you cannot access on your own?	
No	11 (61.1)
Yes	7 (38.9)
List additional medical conditions	
Get laboratory tests to my primary care provider	1
Pain in hip and hand	1
Mental health	1
Urinary tract infection	1
Attention-deficit/hyperactivity disorder	1
Is there anything that the CP HCV iLink Program could do to improve?	
No	16 (94.1)
Improve medication procurement	1 (5.9)
Abbreviations: CP. community paramedic: HCV. hepatitis C virus.	

the highest rates of acute and chronic HCV dating back as far as 2018. A staggering 4 of every 5 patients in the program (82.4%) achieved SVR-12, highlighting the effectiveness of this model of treatment delivery to cure HCV in hard-to-reach populations. This is comparable to the SVR rates of other studies serving vulnerable populations, which show SVR rates from 22.9% to 93.5% for people who inject drugs [14, 23, 24] and 83.3% among those who are unstably housed [14].

Additionally, this program had loss to follow-up comparable to that of other interventions serving vulnerable populations. Whereas other studies with people who inject drugs and rural patients with HCV reported dropout rates of 4.4% to 16.9% [12, 14, 26], our study has a loss to follow-up of 17.6%. This is within our comparably small sample size of patients whose office-based treatment had already failed and were beginning the study as having been lost to follow-up. This rural population within South Carolina may have a slightly higher loss to follow-up secondary to many known gaps in care for South Carolina patients, especially surrounding linkage [27]. Other telehealth programs served those with the motivation and means to be able to access harm reduction programs [14-16, 26, 28]. In contrast, our program worked exclusively with patients who had little to no access to any health care resources and no additional benefit to access harm reduction. An additional challenge was patient wariness of receiving any health care resources, possibly due to a perceived fear of stigmatization [15, 29]. This was apparent for 2 of the 6 individuals, as they refused to open the door for the CP during the 4-week visit. We recommend persistence and patience when providing resources to these hard-to-reach populations. Our research coordinators collected the phone number for the patient, as well as an emergency contact number and social media contact information. Multiple calls and messages were sent to all forms of communication to encourage participation in treatment. When these calls and messages failed, a letter was mailed to the last known address encouraging the patient to reach out when ready to engage in treatment. While patients moving away cannot reasonably be expected to remain within the study, those who remain in the area may be reenrolled one day and should be welcomed back to treatment with no judgment or stigmatization.

The utilization of CPs is uniquely capable of connecting hard-to-reach rural populations to HCV treatment. Whereas many programs recruit vulnerable HCV-positive populations at opioid treatment programs [13, 16, 28] or syringe service programs [26, 30–32], these are still available only to patients with access. Herein, by targeting patients seeking treatment in the ED, the current program provided treatment to a population with little to no access to outpatient health care resources and/or harm reduction services. Furthermore, although telemedicine HCV treatment aims to further increase HCV treatment availability, treatment delivery may not make these

services accessible to all. For example, in many studies, patients receiving telemedicine HCV treatment would still be required to receive laboratory testing at or near the facilities where the telemedicine intervention is offered [14, 29]. Even in a rural Oregon program where telemedicine visits take place within the home, peer navigators may be called on to transport or navigate participants to obtain necessary laboratory resources [30]. Additionally, telemedicine programs may insist that the patient obtain at least 1 in-clinic physical examination [11]. In contrast, the current program responds directly to recommendations to decrease system- and provider-level barriers by decentralizing laboratory testing and treatment provision [4], providing all services within the home.

Whereas many models of facilitated telemedicine for HCV treatment have incorporated advanced practitioners [13], clinicians, hepatologists or specialists [12, 14], case managers [15] or peer navigators [30], to our knowledge this is the first HCV treatment model that utilizes a CP to serve as an extension of the ID physician. The CPs utilized here can uniquely address many of the current barriers associated with telehealth programs, by providing a full physical examination at the direction of the linked physician and obtaining laboratory tests, even in patients with challenges to typical venipuncture by utilizing ultrasound-guided techniques. The CPs can perform and are comfortable performing all these services in the patient's home. As paramedics who receive supplementary training, they are well acquainted with entering and rendering care to patients in almost any situation and tending to patients under the worst possible circumstances. These CPs are therefore well suited to resolve multiple issues and have the added benefit of using local emergency medical service vehicles, which can support poor broadband internet access [16] with HIPAAcompliant devices/programs to ensure telehealth security [11]. Additionally, CPs provide many aforementioned beneficial aspects of facilitated HCV telehealth interventions. For example, the CP puts a live face on HCV treatment, a characteristic often highlighted as being valuable by several telemedicine intervention providers. In a qualitative interview of staff at an opioid treatment program providing HCV telemedicine treatment, 1 provider emphasized the importance of having an individual present to facilitate the telemedicine treatment, stating that initial in-person interactions were important to form the patient-provider relationship [16]. Furthermore, having a CP consultation and follow-up offers the patient the opportunity to connect to additional treatment sources. In the current study, 4 patients were enrolled in the mobile integrated health care program, a program provided by the health care system that allows weekly follow-up with a CP to address pressing health care needs. Each patient was able to be connected to additional services, including medication-assisted treatment, primary care, and social services (eg, housing).

High patient satisfaction in the current study is consistent with the findings of previous studies. Many patients report that they are more satisfied with HCV telemedicine visits than face-to-face visits [33, 34]. One important aspect of telemedicine interventions often cited by patients is feeling more involved in their overall care [11, 33]. This was demonstrated in the current model: 3 of every 4 patients strongly agreed that they were more informed about their medical conditions and diagnoses because of their CP program interactions, and over half strongly agreed that they were more able and comfortable addressing and improving their overall health. The high satisfaction rate could further be explained by the decrease in stigma commonly felt by telehealth participants [15, 34]. For example, previous studies suggest that facilitated telemedicine programs integrated into opioid treatment programs allow participants to avoid stigma that they might encounter in conventional health care settings [15, 34]. The current model allowed participants to avoid that stigma by working with an empathetic health care provider within the comfort of the participant's home, as 3 of every 4 participants strongly agreed that CP staff were caring and empathetic during each encounter. In all, the CP HCV iLink study reported levels of patient satisfaction similar to those in other facilitated telehealth interventions, highlighting the capability of this novel intervention to deliver high-quality care to patients who are vulnerable and HCV positive.

Limitations

These findings represent the implementation of a pilot program in a small rural population of a single Southern state and therefore may not be generalizable to other rural populations. This was also a single-arm study with no comparator group. Additional research will be needed to compare the effectiveness of this model with office-based treatment models or other interventions across all patients. The small sample size of our program allowed us to provide more personalized care, which may not have been possible with a larger sample size of patients. This population was further limited to those who had regular access to a phone that they could use to schedule and confirm appointments. Thus, these findings may not be generalized to patients who are unstably housed with no access to a telephone. Finally, approximately half did not fill out the voluntary participant satisfaction survey. It is possible that those who were highly satisfied with the program were more motivated to respond to the survey than those who chose not to respond.

CONCLUSIONS

CP HCV iLink was found to be an effective model for HCV treatment to successfully initiate and cure hard-to-reach rural individuals who were HCV positive. By limiting all barriers to accessing outpatient treatment through use of a CP, this

model truly increases the accessibility of HCV treatment to those most in need of treatment.

Supplementary Data

Supplementary materials are available at *Open Forum Infectious Diseases* online. Consisting of data provided by the authors to benefit the reader, the posted materials are not copyedited and are the sole responsibility of the authors, so questions or comments should be addressed to the corresponding author.

Notes

Acknowledgments. We are grateful for everyone in the Prisma Health Mobile Integrated Healthcare program who assisted with the work to make this program a success. Specifically, we are grateful for the contributions of community paramedics Anson Hawkins, Scott Gosnell, and Katy Jones. We also acknowledge the outstanding contributions of Aaron Dix and Kent Whitten, who have shown unconditional support for this program.

Financial support. This work was supported in part by an internal seed grant from the Health Sciences Center at Prisma Health, Greenville, South Carolina.

Potential conflicts of interest. A. H. L. has served on advisory board for Merck Pharmaceuticals, AbbVie and Gilead Sciences. A. H. L. has received research grants from Merck Pharmaceuticals and Gilead Sciences. P. M. has received research grants from Gilead Sciences. No other authors declared any conflict of interest related to this work.

References

- US Health and Human Services. Viral hepatitis in the United States: data and trends. 2021. Available at: https://www.hhs.gov/hepatitis/learn-about-viralhepatitis/data-and-trends/index.html. Accessed 8 December 2021.
- US Centers for Disease Control and Prevention. Viral hepatitis: hepatitis C information. 2019. Available at: https://www.cdc.gov/hepatitis/hcv/index.htm. Accessed 8 December 2021.
- South Carolina Department of Health and Environmental Control. The South Carolina annual morbidity report on reportable conditions. 2018. Available at: https://scdhec.gov/sites/default/files/media/document/2018-Morbidity_Report_ on_Reportable_Conditions-CR-012452.pdf. Accessed 1 December 2023.
- Taha G, Ezra L, Au-Freha N. Hepatitis C elimination: opportunities and challenges in 2023. Viruses 2023; 15:1413.
- Shull JA, Attys JM, Amutah-Onukagha NN, Hill MJ. Utilizing emergency departments for pre-exposure prophylaxis (PrEP). J Am Coll Emerg Physicians Open 2020; 1:1427–35.
- Higuera-de la Tijera F, Servin-Caamano A, Servin-Abad L. Progress and challenges in the comprehensive management of chronic viral hepatitis: key ways to achieve the elimination. World J Gastroenterol 2021; 27:4004–17.
- Calner P, Sperring H, Ruiz-Mercado G, et al. HCV screening, linkage to care, and treatment patterns at different sites across one academic medical center. PLoS One 2019; 14:e0218388.
- Amoako A, Ortiz-Paredes D, Engler K, Lebouche B, Klein MB. Patient and provider perceived barriers and facilitators to direct acting antiviral hepatitis C treatment among priority populations in high income countries: a knowledge synthesis. Int J Drug Policy **2021**; 96:103247.
- Paisi M, Crombag N, Burns L, et al. Barriers and facilitators to hepatitis C screening and treatment for people with lived experience of homelessness: a mixedmethods systematic review. Health Expect 2022; 25:48–60.
- Kruse C, Heinemann K. Facilitators and barriers to the adoption of telemedicine during the first year of COVID-19: systematic review. J Med Internet Res 2022; 23: e31752.
- 11. Parmar P, Mackie D, Varghese S, Cooper C. Use of telemedicine technologies in the management of infectious diseases: a review. Clin Infect Dis **2015**; 60:1084–94.
- Nevola R, Rosato V, Conturso V, et al. Can telemedicine optimize the HCV care cascade in people who use drugs? Features of an innovative decentralization model and comparison with other micro-elimination strategies. Biology (Basel) 2022; 11:805.

- Talal AH, Andrews P, Mcleod A, et al. Integrated, co-located, telemedicine-based treatment approaches for hepatitis C virus management in opioid use disorder patients on methadone. Clin Infect Dis 2019; 69:323–31.
- 14. Sivakumar A, Madden L, DiDomizio E, Eller A, Villanueva M, Altice FL. Treatment of hepatitis C virus among people who inject drugs at a syringe service program during the COVID-19 response: the potential role of telehealth, medications for opioid use disorder and minimal demands on patients. Int J Drug Policy 2022; 101:103570.
- Talal AH, Jaanimagi U, Dharia A, Dickerson SS. Facilitated telemedicine for hepatitis C virus: addressing challenges for improving health and life for people with opioid use disorder. Health Expect 2023; 26:2594–607.
- Ventuneac A, Dickerson SS, Dharia A, George SJ, Talal AH. Scaling and sustaining facilitated telemedicine to expand treatment access among underserved populations: a qualitative study. Telemed J E Health 2023; 29:1862–9.
- Bigham BL, Kennedy SM, Drennan I, Morrison LJ. Expanding paramedic scope of practice in the community: a systematic review of the literature. Prehosp Emerg Care 2013; 17:361–72.
- Burnett A, Wewerka S, Miller P, et al. Community paramedicine intervention reduces hospital readmission and emergency department utilization for patients with cardiopulmonary conditions. West J Emerg Med 2023; 24:786–92.
- Louras N, Reading Turchioe M, Shafran Topaz L, et al. Mobile integrated health interventions for older adults: a systematic review. Innov Aging 2023; 7:igad017.
- Langabeer JR II, Yatsco A, Champagne-Langabeer T. Telehealth sustains patient engagement in OUD treatment during COVID-10. J Subst Abuse Treat 2021; 122: 108215.
- American Association for the Study of Liver Diseases, Infectious Diseases Society of America. Simplified HCV treatment for treatment-naive adults without cirrhosis. 2023. Available at: https://www.hcvguidelines.org/treatment-naive/simplifiedtreatment. Accessed 1 March 2024.
- Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform 2009; 42:377–81.
- Harris PA, Taylor R, Minor BL, et al. The REDCap consortium: building an international community of software platform partners. J Biomed Inform 2019; 95: 103208.
- US Census Bureau. American Community Survey: poverty status in the past 12 months. 2022. Available at: https://data.census.gov/table/ACSST5Y2022.S1701? g=0500000US29605. Accessed 1 March 2024.
- 25. US Census Bureau. How the census bureau measures poverty. 2023. Available at: https://www.census.gov/topics/income-poverty/poverty/guidance/poverty-meas ures.html. Accessed 1 March 2024.
- Eckhardt B, Mateu-Gelabert P, Aponte-Melendez Y, et al. Accessible hepatitis C care for people who inject drugs: a randomized clinical trial. JAMA Intern Med 2022; 182:494–502.
- 27. Blanding DP, Moran WP, Bian J, et al. Linkage to specialty care in the hepatitis C care cascade. J Investig Med **2021**; 69:324–32.
- Tsui JI, Lum PJ, Taylor LE, et al. Injecting practices during and after hepatitis C treatment and associations with not achieving cure among persons who inject drugs. Drug Alcohol Depend 2023; 247:109878.
- Talal AH, George SJ, Talal LA, et al. Engaging people who use drugs in clinical research: integrating facilitated telemedicine for HCV into substance use treatment. Res Involv Engagem 2023; 9:63.
- 30. Herink MC, Seaman A, Leichtling G, et al. A randomized controlled trial for a peerfacilitated telemedicine hepatitis C treatment intervention for people who use drugs in rural communities: study protocol for the "peer teleHCV" study. Addict Sci Clin Pract 2023; 18:35.
- Walters SM, Frank D, Felsher M, et al. How the rural risk environment underpins hepatitis C risk: qualitative findings from rural southern Illinois, United States. Int J Drug Policy 2023; 112:103930.
- Carnes NA, Asher AK, Bohm MK, Bessler PA. Access to HIV, viral hepatitis, and substance use disorder treatment/overdose prevention services: a qualitative analysis of syringe service programs (SSPs) serving rural PWID. Subst Use Misuse 2021; 56:1933–40.
- Haridy J, Iyngkaran G, Nicoll A, Hebbard G, Tse E, Fazio T. Ehealth technologies for screening, diagnosis, and management of viral hepatitis: a systematic review. Clin Gastroenterol Hepatol 2021; 19:1139–1150.e30.
- Talal AH, Sofikitou EM, Wang K, Dickerson S, Jaanimagi U, Markatou M. High satisfaction with patient-centered telemedicine for hepatitis C virus delivered to substance users: a mixed-methods study. Telemed J E Health 2023; 29:395–407.