



Barriers and facilitators of hepatitis C treatment uptake among people who inject drugs enrolled in opioid treatment programs in Baltimore



Oluwaseun Falade-Nwulia^{a,*}, Risha Irvin^a, Alana Merkow^a, Mark Sulkowski^a, Alexander Niculescu^a, Yngvild Olsen^b, Kenneth Stoller^a, David L. Thomas^{a,c}, Carl Latkin^c, Shruti H. Mehta^c

^a Johns Hopkins University School of Medicine, Baltimore, MD, United States of America

^b Institute for Behavior Resources, Inc, REACH Health Services, Baltimore, MD, United States of America

^c Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, United States of America

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ABSTRACT

Background: Hepatitis C virus (HCV) infection is a major public health issue among people who inject drugs (PWID) with prevalence of 50–80% in the United States. Effective, simple, oral direct acting agents (DAA) of short duration with minimal side effects have been associated with cure rates > 95%. However, HCV treatment uptake among PWID remains low. We characterized the HCV care continuum, HCV treatment knowledge, as well as barriers and facilitators to HCV treatment uptake among PWID enrolled in two opioid treatment programs (OTPs) in Baltimore, Maryland, USA.

Methods: Between July and November 2016, 124 HCV infected PWID were recruited from two opioid treatment programs in Baltimore through convenience sampling. Participants completed a 50-item questionnaire to assess HCV treatment knowledge, attitudes, and practices. Progress through the HCV care continuum was assessed based on a series of questions assessing evaluation for HCV treatment, recommendation for HCV treatment by a provider, and HCV treatment initiation. HCV status was assessed based on participant self-report.

Results: The median age was 52 years (IQR 44–58), 56% were male, the majority were African American (69%), and 19% reported HIV coinfection. Participants had been tested for HCV at their primary care provider's (PCP's) office (34%), drug treatment center (20%), emergency room (11%), or prison (9%), and most (60%) had been diagnosed with HCV over 5 years prior. The majority reported that HCV was a major health concern for them (91%), were aware there were new treatments for HCV (89%), and that the new treatments cure most people (69%). More than half (60%) had seen a health professional who could treat HCV, 40% had HCV therapy recommended by their HCV specialist, and 20% had started or completed treatment. In univariable analysis, PWID were significantly more likely to have been treated if they were HIV co-infected (OR 3.4 (95% CI 1.3–9.2)) or had a partner or friend concerned about their HCV (OR 3.4 (95% CI 1.2–9.7)), and were significantly less likely to have been treated if they had used any illicit drugs in the preceding 6 months (OR 0.4 (95% CI 0.2–0.99)). In multivariable analysis, having a friend or partner concerned about their HCV remained significantly associated with HCV treatment (OR 5.0 (95% CI 1.4–17.7)). When questioned about what would facilitate HCV treatment, the majority (85%) reported that a friend telling them that HCV treatment had helped them and having HCV treatment provided at their opioid treatment program would make them more likely to engage in HCV treatment.

Conclusion: Despite a high prevalence of HCV among opioid treatment program patients and the availability of effective treatments, uptake remains low. We identified several key barriers and facilitators that can affect HCV treatment uptake.

1. Introduction

Chronic hepatitis C virus (HCV) is the leading cause of cirrhosis and

hepatocellular carcinoma (HCC), the leading indication for liver transplant, and as of 2014, was associated with more deaths in the US than all other reportable infectious diseases combined (Ly, Hughes,

* Corresponding author at: 725 N. Wolfe Street, Suite 215, Baltimore, MD 21205, United States of America.

E-mail address: ofalade1@jhmi.edu (O. Falade-Nwulia).

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Jiles, & Holmberg, 2016; Rosen, 2011). Injection drug use is the primary mode of transmission for HCV infection in high income countries, with incidence rates of 16–42% per year (Edlin & Carden, 2006). As such, people who inject drugs (PWID) are disproportionately impacted by HCV, with prevalence of 50–80% compared to prevalence of 1.1% in the general US population and 3.25% for individuals born between 1945 and 1965 (the CDC defined “baby boomer birth cohort”) (Denniston et al., 2014; Mehta et al., 2011; Nelson et al., 2011; Sulkowski & Thomas, 2005). Moreover, due to the current opioid epidemic in the US, HCV incidence is on the rise, highlighting the importance of understanding and addressing the barriers to care (Zibbell et al., 2018).

Rapid improvements in HCV therapies have led to the availability of effective, simple, oral direct-acting agents (DAA) with minimal side effects. DAAs are associated with sustained virologic response (SVR) and HCV cure rates of 95% or higher for most populations, including PWID and across HCV genotypes (Dore et al., 2016; Falade-Nwulia et al., 2017). HCV treatment is associated with improved quality of life, and reduction in incidence of hepatocellular cancer, end stage liver disease, liver related and all-cause mortality (Backus, Belperio, Shahoumian, & Mole, 2018; Limketkai et al., 2012; Stepanova et al., 2018). Modeling data further suggest that HCV treatment of PWID can reduce HCV prevalence and incidence among PWID (Hickman, De Angelis, Vickerman, Hutchinson, & Martin, 2015). Moreover, these data suggest that treatment of PWID for HCV is not only cost-effective, but more cost-effective than treating those at an equivalent stage of liver disease with no ongoing risk of HCV transmission to others (Hickman et al., 2015). Recent findings from Australia indicate that as of 2015 (in the DAA era), HCV treatment uptake among PWID remained low, with only 8% of PWID receiving antivirals (Iversen et al., 2017). More recent data from North America suggest ongoing low rates (7–16%) of HCV treatment in the DAA era (Socias et al., 2019; Tsui et al., 2018). HCV treatment uptake among PWID remains low due to several system, provider, and patient level barriers, such as limited locations for HCV testing and treatment, insurance restrictions on HCV therapy coverage for individuals with substance use disorders, perceived stigma by PWID in the healthcare system, lack of willingness of providers to treat PWID for HCV, limited HCV knowledge among PWID, and low prioritization of HCV treatment by PWID (Asher et al., 2016; Doab, Treloar, & Dore, 2005; Mehta et al., 2008; Skeer, Ladin, Wilkins, Landy, & Stopka, 2018). In the US, opioid treatment programs (OTPs) routinely provide services to PWID with approximately 300,000 individuals enrolled in such programs (SAMHSA, 2013). There is, however, limited real world data on knowledge, attitudes, and practices including rates of HCV treatment, and barriers to and facilitators of HCV treatment among PWID attending OTPs in the oral DAA era. This study aims to evaluate HCV treatment knowledge, attitudes, and practices among PWID in two OTPs in an urban setting with high per capita prevalence of injection drug use.

2. Methods

2.1. Sample

To be eligible for this study, participants had to be 18 years of age or older, report a history of HCV infection, report a history of injection drug use, and be enrolled for drug treatment services at either of the 2 OTPs participating in the study in Baltimore, Maryland, USA. The first OTP has a census of 650 patients and a fully integrated behavioral health program that provides comprehensive substance use disorder care including opioid detoxification, standard and intensive outpatient opioid maintenance, case management, and mental health services. The other OTP has a patient census of 120 and similarly provides comprehensive outpatient substance use disorder treatment. At both programs, patients receive individual counseling, substance abuse education, sobriety planning, relapse prevention, HIV education and risk reduction

counseling, and referral to hospital and community resources. At the time of study enrollment, neither site provided onsite primary care, rapid HCV testing, or HCV treatment. Between July and November 2016, 124 PWID were recruited by convenience sampling, through study fliers placed at both OTPs in Baltimore. Interested OTP patients were referred to study staff to complete a screening questionnaire during routine clinic visits. Eligible participants completed a 15–20 min, interviewer-administered survey.

Participants were reimbursed for their time with a \$10 gift card to a local grocery store, restaurant, or general merchandise shop. Johns Hopkins School of Medicine's ethics committee (institutional review board [IRB] no. IRB00090510) approved all study procedures.

2.2. Measures

A previously validated survey utilizing the Andersen's behavioral model to help understand barriers to HCV treatment uptake through predisposing, enabling, and need factors was adapted for use in this study (Andersen, 1995; Mehta et al., 2008). The survey consisted of 50 questions that primarily used categorical response options. Progress through the HCV care continuum was assessed based on a series of binary questions assessing evaluation for HCV treatment, recommendation for HCV treatment by a provider, and HCV treatment initiation. Barriers to progression through the HCV care continuum were explored by asking study participants to pick from a pre-specified list of potential HCV treatment barriers. Participants were also asked to list, as an open response, any other barriers to HCV treatment not on the pre-specified list. These open ended responses were then categorized by study investigators. Additional questions assessed knowledge of HCV, attitudes towards HCV, and potential facilitators of HCV treatment. These were presented as statements that participants were asked to pick a level of agreement with on a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). For these analyses, strongly agree and agree were grouped together as a measure of agreement and strongly disagree and disagree were grouped together as a measure of disagreement. Participants were also asked to list, as an open response, any other facilitators to HCV treatment not on the pre-specified list. These open ended responses were then categorized by study investigators. Hazardous alcohol use was assessed using the AUDIT-C tool, which creates a composite score from three questions about alcohol consumption. Scores of 4 or above for men and 3 or above for women are considered consistent with hazardous alcohol use (Bradley et al., 2003; Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998).

2.3. Statistical analyses

Descriptive statistics were used to characterize the study population with respect to demographics and risk behaviors. Proportions were compared using Chi-square tests. Univariable and multivariable logistic regression analyses were used to determine odds ratios for factors associated with HCV treatment. Factors were considered for inclusion in multivariable analysis if they demonstrated an association with the outcome at the level of $p < 0.05$ in univariate analysis. Factors such as age, race and sex, previously known to be associated with HCV treatment uptake from a review of the literature, were also included in the multivariable analyses (Falade-Nwulia et al., 2016; Kanwal et al., 2016; Marcus et al., 2018; Radwan et al., 2019; Saeed et al., 2017; Socias et al., 2019; Spradling et al., 2018). All analyses were performed using Stata version 13 (Stata Corp, College Station, Texas).

3. Results

3.1. Demographics

Among 124 PWID who self-reported a history of HCV infection, the median age was 52 years (IQR 44–58), 56% were male, the majority

Table 1
Study population (n = 124).

Demographics	N (%)
Age, median (IQR) years	52 (44–58)
Male	70 (56)
African American	86 (69)
HIV infected	24 (19)
Recruited from OTP clinic 1	83 (67)
Recruited from OTP clinic 2	41 (33)
Duration of knowledge of HCV infection (years)	
< 1 year	18 (15)
1 year to 5 years	32 (26)
5 years to 10 years	20 (16)
Over 10 years	54 (44)
Site where HCV diagnosis made	
PCP	42 (34)
Drug treatment center	25 (20)
Emergency room	14 (11)
Prison	11 (9)
Injection drug use in preceding 12 months	53 (43)
Any drug use in preceding 6 months	79 (64)
Alcohol use in preceding 12 months	57 (46)
Hazardous alcohol use in preceding 12 months	39 (31)
Has PCP	104 (84)

Note: PCP: Primary care provider.

*Hazardous alcohol use defined as an AUDIT-C score of ≥ 4 for men and ≥ 3 for women.

were African American (69%), and 19% reported HIV coinfection (Table 1). The most common drugs ever used by injection were heroin (98%), cocaine (85%), and cocaine and heroin together (speedball) (87%). Injection drug and hazardous alcohol use in the preceding 12 months were reported in 43% and 31% of respondents, respectively. The majority of patients had been diagnosed with HCV at a PCP's office (34%), drug treatment center (20%), emergency room (11%), or prison (9%), and (60%) had been aware of their HCV diagnosis for over 5 years.

3.2. HCV attitudes and knowledge

The majority (91%) reported that HCV was a major health concern for them and wanted more information about how to protect themselves and their friends from infection (90%). The majority (73%) of those surveyed were aware of the risk of HCV transmission through shared cookers. Seventy-two percent were aware of a potential risk of HCV reinfection after cure. With respect to treatment, 93% of participants believed their PCP would recommend HCV treatment if they needed it (Table 2). The majority had shared their HCV diagnosis with friends (65%), reported that others had shared their HCV diagnosis with them (75%), and had friends who talked about HCV with them (60%). Additionally, more than half (58%) of participants strongly agreed or agreed with the statement "I have a friend or partner who is concerned about my HCV." About half (48%) had been involved in discussions of new HCV treatments with friends. The majority were aware that new treatments cure most people (69%), but most were not aware that these new HCV treatments included only pills (36%) and that they did not have major side effects (34%).

3.3. HCV care continuum

Among 124 OTP clients with a self-reported history of HCV infection, 74 (60%) had seen a clinician who could treat HCV, 49 (40%) had HCV therapy recommended by their HCV specialist, and 24 (20%) had started or completed treatment (Fig. 1). Of those treated, most ($n = 20$) received oral DAA therapy for 12 or 24 weeks. Among those who had not seen an HCV treating provider ($n = 50$), the major barriers were lack of a specialist referral or lack of recommendation by their PCP to

Table 2
Knowledge of and attitudes towards HCV and treatment (n = 124).

Attitudes and practices	N (%)
Shared HCV diagnosis with others	60 (48)
Others have shared HCV diagnosis with them	93 (75)
Know someone who died of liver disease	69 (56)
Friends talk about HCV	75 (60)
Friends talk about new HCV treatments	60 (48)
Partner or friend who is concerned about their HCV	72 (58)
HCV a major health concern	113(91)
Want more information about protecting self and friends from HCV	101(81)
Believe PCP will recommend treatment if they need it	115(93)
HCV knowledge	
Aware that there are new treatments for HCV	110(89)
Aware that new HCV treatments cure most people	85 (69)
Aware that new HCV treatments are all oral	45 (36)
Aware of limited HCV treatment side effects	42 (34)
Aware that HCV can be transmitted through shared cookers and injection water	91(73)
Aware that HCV reinfection is possible	89 (72)

Note: PCP: Primary care provider.

seek treatment (68%), competing priorities including addiction and other medical concerns (42%), and lack of knowledge regarding treatment (16%). Among those who saw an HCV treating provider, but did not have HCV therapy prescribed ($n = 25$), the major reason was lack of significant liver disease (60%). Among those prescribed HCV therapy who did not start treatment ($n = 25$), the major reasons were not considering HCV treatment a priority (32%), need for additional tests (28%), lack of provider follow-up (12%), and insurance not covering the HCV drug costs (12%). Among those who had not been treated for HCV, 89% reported an interest in receiving HCV treatment; most of whom wanted to start treatment immediately (81%) or within the next 6 months (13%).

In the univariable analysis, PWID were significantly more likely to have been treated if they were HIV co-infected (OR 3.4 95% CI 1.3–9.2) or had a partner or friend who was concerned about their HCV (OR 3.4 (95% CI 1.2–9.7) and less likely to have been treated if they had used any illicit drugs in the preceding 6 months (OR 0.4 (95% CI-0.16-0.99) (Table 3). In the multivariable analysis, the only factor that remained statistically significantly associated with HCV treatment was having a partner or friend concerned about the participant's HCV (OR 5.0 (95% CI 1.4–17.7)). When asked about potential facilitators of HCV treatment, assessed through statements with Likert scale responses, support for transportation to and from appointments, HCV treatment at the OTP clinic, and a report from a friend that HCV treatment had helped them, were endorsed by most PWID as factors that would make them more likely to engage in HCV treatment (Fig. 2). Among 68 PWID providing additional open-ended responses to potential facilitators of HCV treatment, 51% reported that having more information about HCV disease, including knowledge of treatment options, how to access these therapies, and what treatment would involve, would facilitate HCV treatment among PWID.

4. Discussion

Among a group of PWID enrolled in OTPs in an urban area, we found moderate levels of knowledge about oral DAA HCV treatment with a majority (69%) aware that there were new treatments available for HCV but only approximately a third aware that these treatments were all oral treatments with limited side effects. This relative lack of information on availability and tolerability of currently available DAA regimens underscores the important role of health professionals and peers, in educating patients on oral DAA treatment characteristics. The role of health professionals in positively impacting attitudes towards and uptake of HCV treatment is further highlighted by the high

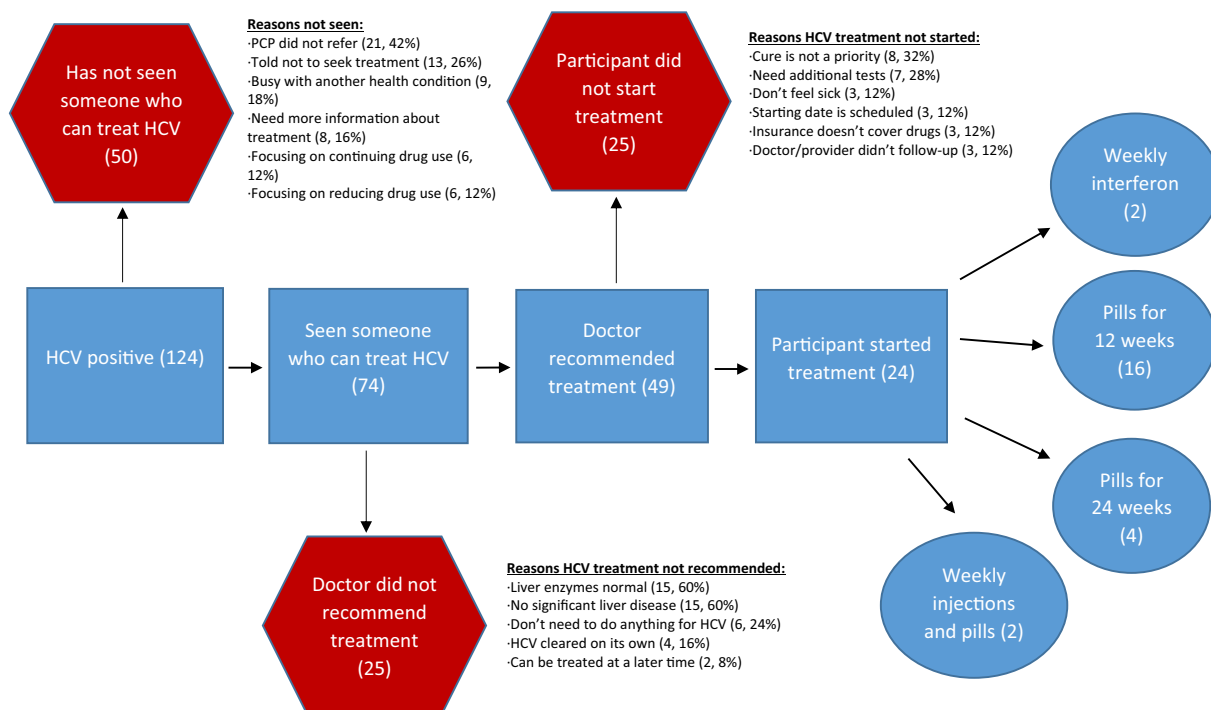


Fig. 1. Flow diagram of progress through the HCV care continuum for 124 HCV Infected opioid treatment program clients with reasons for lack of progress through the HCV care continuum.

percentage of PWID (93%) who reported that they believe their PCP would recommend HCV treatment if they need it. Conversely, this would suggest that if treatment is not recommended by PCPs, PWID may perceive HCV treatment as not important.

We also found that 20% of individuals sampled had been treated for HCV in the oral DAA era. This treatment rate of 20% is higher than that reported in the interferon era, but significantly lower than that required to achieve the HCV elimination goals stipulated by the World Health Organization of 90% diagnosed, 80% treated, and 65% reduction in mortality by 2030 (*World Health Organization: Draft global health sector strategy on viral hepatitis, 2016–2021 - The first of it's kind*, 2015). Additionally, this treatment rate was observed in a population of PWID who are engaged in the health care system through regular attendance at OTP clinics and already aware of their HCV infection. Based on findings that suggest higher rates of linkage to HCV care services in PWID enrolled in an OTP (2.12 greater odds in patients enrolled in methadone maintenance treatment compared to those not enrolled), we would expect overall PWID HCV treatment rates lower than that

reported in this group of PWID (Ti et al., 2018).

Oral DAAs have been shown to have high efficacy for HCV cure among PWID engaged in substance use disorder treatment through OTPs (Dore et al., 2016). However, for these high efficacy rates to translate into population level effectiveness, there is a need to better understand barriers and facilitators to progression through the HCV care continuum so they can be acted upon to optimize the care system. Despite high interest in HCV treatment, the often complex steps required for HCV treatment initiation, including specialist referral, insurance prior authorization processes and in some cases, drug use abstinence requirements, continue to be a barrier to HCV treatment uptake among PWID (Barua et al., 2015). Particularly, among those who saw an HCV treatment specialist, but did not have treatment recommended, the high proportion of participants who were not recommended for HCV treatment due to lack of significant liver disease (60%) highlights the barriers created by insurance policies. Liver fibrosis stage restrictions implemented in many states in the US negatively impact progress through the care continuum and inadvertently

Table 3
Factors associated with HCV treatment (n = 124).

Characteristic	HCV untreated N = 100 N (%)	HCV treated N = 24 N (%)	Uni-variable odds ratio	95% CI	Multi-variable odds ratio	95% CI
Median age (years)	51.5 (44–58)	54.5 (49–57)	1.03	0.98–1.08	1.03	0.96–1.2
Male	58 (58)	12 (50)	0.72	0.30–1.77	0.42	0.14–1.19
African American	64 (64)	19 (79)	2.14	0.74–6.21	0.90	0.22–3.70
HIV infected	15 (15)	9 (38)	3.40	1.26–9.17	2.27	0.72–7.16
*Recent drug use	68(68)	11(46)	0.40	0.16–0.99	0.39	0.14–1.06
Hazardous alcohol use	30 (30)	9 (38)	1.4	0.55–3.55		
Primary care provider	83 (83)	21 (88)	1.43	0.38–5.35		
Aware of DAA effectiveness	67 (67)	18 (75)	1.77	0.61–5.19		
Have a friend that died of liver disease	56(56)	13(54)	1.70	0.82–3.49		
Have a partner or friend concerned about their HCV	53 (53)	19 (79)	3.37	1.16–9.73	5.02	1.4–17.67

Note: Significant factors highlighted in bold text.

*Recent drug use defined as any illicit drug use in the preceding 6 months.

*Hazardous alcohol use defined as an AUDIT-C score of ≥ 4 for men and ≥ 3 for women.

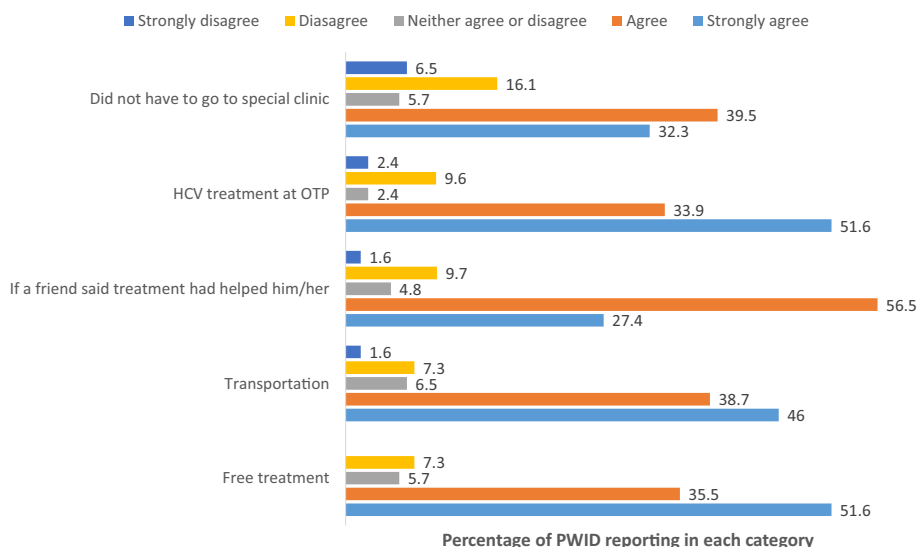


Fig. 2. Perceived facilitators of HCV treatment among PWID.

send a message that HCV care and cure is not a health care priority, threatening the achievement of WHO HCV elimination goals (*World Health Organization: Draft global health sector strategy on viral hepatitis, 2016–2021 - The first of it's kind*, 2015). This negative impact is further amplified among PWID, many of whom are likely to be insured by Medicaid, which in many states in the US is associated with the highest rates of insurance denial of HCV therapy coverage (Lo Re 3rd et al., 2016). Requiring PWID to wait until their liver condition deteriorates endangers the opportunity to link PWID to HCV treatment and cure. Given the difficulty in reaching PWID populations for initial linkage to care, this system level barrier will need to be addressed to increase HCV treatment uptake among PWID.

The major patient level barriers to HCV treatment in this study, competing priorities including substance use, other medical concerns and lack of information on treatment, have previously been identified in the interferon era and persist in the oral DAA era (Grebely et al., 2008; Mehta et al., 2008). Conversely, a major facilitator of HCV treatment was having a friend or partner who was concerned about the individual's HCV. This finding is consistent with previous research in which peer education and support has been shown to increase rates of linkage to care for HCV and HCV treatment completion among PWID (Bruggmann & Litwin, 2013; Crawford & Bath, 2013; Grebely et al., 2010; Treloar & Holt, 2008). The increased rates of treatment linkage and completion likely occur through a variety of support mechanisms including provision of critical resources such as transportation to appointments, emotional and material support, and peer education (Latkin et al., 2013). Peer support mechanisms have been used for a variety of chronic disease management models among PWID. For example, among HIV-infected PWID, peer support is strongly associated with both increased access to HIV care and antiretroviral therapy adherence (Knowlton et al., 2007; Knowlton, Hua, & Latkin, 2005). Furthermore, of those not prescribed treatment, 28% attributed this to their HCV provider stating they do not need to do anything for HCV. Likely, the messaging by providers gave the impression that HCV infection did not require medical attention, which speaks to communication barriers between providers and patients. Peer support has the potential to modulate these misperceptions by emphasizing the importance of HCV treatment. These data suggest that a large proportion of participants (60%) had talked to their friends about HCV and new HCV treatments (48%), suggesting that HCV infection is a common topic of discussion among PWID and their networks. The emergent challenge is creating a peer support system that is knowledgeable about HCV and current treatment options, and thus better able to steer

network members to testing and treatment.

In univariable analysis, HIV infection was associated with an increased likelihood of HCV treatment. The mechanism for this may be due to an increased likelihood of prior engagement with the health care system for HIV care. This engagement provides HIV infected patients with more HCV care engagement resources, such as information on locations to access HCV treatment, access to a medical provider who can treat their HCV, or long term relationships with providers and case management services that can facilitate their linkage to HCV treatment. It is also possible that providers prioritize HCV treatment of HIV/HCV coinfecting PWID due to the increased risk of liver disease progression in HIV/HCV coinfecting compared to HCV monoinfected individuals (Benhamou et al., 1999; Kirk et al., 2013; Lo Re 3rd et al., 2014). The only factor that remained statistically significantly associated with HCV treatment in multivariable analysis was having a friend or family member concerned about an individual's HCV. This is consistent with previous evidence suggesting that peer support improves health outcomes for PWID (Bassuk, Hanson, Greene, Richard, & Laudet, 2016; Hay, Henderson, Maltby, & Canales, 2016; Reif et al., 2014).

Other potential facilitators of HCV treatment reported by PWID in this study included support for transportation to and from appointments, having a friend report that HCV treatment had helped them, and more information about HCV infection, including locations where HCV care can be accessed and what HCV treatment involved. While peers can be previously unknown to PWID and become a network member through the performance of their role, engagement and training of network members who are already part of an individual's network in HCV care support may also be feasible. An additional advantage for existing network members is the potential to continue to influence harm reduction behavior after HCV cure and consequently reduce the risk of HCV reinfection. Leveraging the social networks of PWID thus has the potential to facilitate penetration of knowledge related to HCV care, provide support through treatment, and offer ongoing support for harm reduction efforts. Further research is needed in this area.

Another major facilitator of treatment identified by PWID was HCV treatment at their OTP clinic. In the era of highly effective oral DAAs and a clear overlap between those at risk for acquiring or transmitting HCV and treatment in an OTP, there is great opportunity to integrate HCV treatment and reinfection prevention for hard-to-reach populations like PWID within OTPs. While data from patients and OTP providers acknowledge that the integration of HCV treatment into OTP would likely increase HCV treatment uptake among PWID, there remain several barriers to this integration (Treloar, Newland, Rance, &

Hopwood, 2010). Notable is the perception that HCV treatment is not a legitimate activity of OTP clinics (Treloar et al., 2010). However, there are structural features within opioid treatment programs and best practice guidelines developed by the Substance Abuse and Mental Health Services Administration (SAMHSA) that may facilitate comprehensive HCV treatment incorporation. Currently, under federal guidelines, OTPs must provide clinical assessment, treatment planning, and evaluation of patient progress in treatment (SAMHSA, 2015). This includes initial and periodic assessment of services for co-occurring disorders such as HIV, hepatitis B (HBV) and HCV, mental health disorders, trauma, tobacco use, and alcohol use disorders. As such, structurally, OTPs present a unique setting to integrate HCV services, as they are already designed to address and accommodate these specific health issues that are prevalent among their clients. Several studies examining diseases associated with injection drug use have demonstrated the effectiveness of integrating disease treatment and prevention interventions into opioid treatment therapy. Such studies show positive outcomes within OTPs, including but not limited to: increased treatment adherence and cure rates for HCV, sustained undetectable HIV viral loads, increased HBV vaccination rates, and risk reduction behavior (Butner et al., 2017; Lawrinson et al., 2008; Litwin et al., 2009; Masson et al., 2013). Further research is needed to assess models for HCV treatment integration into OTP programs in the oral DAA era.

Our study is limited by its small sample size which limits the precision of our estimates. Study participants were also recruited from two not-for-profit OTPs in one urban area of the US. Additionally, one of the programs is closely affiliated with an academic medical center with a large viral hepatitis treatment center. However, it is likely that given similar demographics, barriers and facilitators to HCV treatment experienced by these PWID are similar to those experienced by PWID in many urban cities in the US. Understanding and addressing these self-reported barriers will likely advance a high proportion of PWID through the HCV care continuum. Although these data were collected in 2016 and may not accurately reflect the current day situation, given that majority of the barriers identified remain unchanged, these findings likely remain valid. Given the historically low representation of women in HCV research studies, a major strength of this study includes the high representation of women. Another strength is the detailed characterization of the HCV care continuum and barriers to advancement at each step of the care continuum.

5. Conclusions

In summary, the availability of safe effective oral DAAs has provided a unique opportunity to address HCV, a major health issue prevalent among PWID. However, to achieve the HCV elimination goals set forth by the WHO (*World Health Organization: Draft global health sector strategy on viral hepatitis, 2016–2021 - The first of its kind*, 2015), additional efforts are required to engage populations of PWID who are at the core of the HCV epidemic. These data lend additional support to the beneficial role of network member education and peer support for HCV linkage and treatment completion and should be explored as a component of care models for HCV treatment in OTPs.

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