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Research Paper

Single-visit hepatitis C point-of-care testing, linkage to nursing care, and peer-supported treatment among people with recent injecting drug use at a peer-led needle and syringe program: The TEMPO Pilot Study

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ABSTRACT

Background: Point-of-care hepatitis C virus (HCV) RNA testing can facilitate single-visit diagnosis and treatment. This study evaluated a single-visit test and treat intervention integrating point-of-care HCV RNA testing, linkage to nursing care, and peer-supported engagement/delivery of treatment among people with recent injecting drug use at a peer-led needle and syringe program (NSP).

Methods: TEMPO Pilot is an interventional cohort study of people with recent injecting drug use (previous month) recruited between September 2019-February 2021 from one peer-led NSP in Sydney, Australia. Participants received point-of-care HCV RNA testing (Xpert HCV Viral Load Fingerstick), linkage to nursing care, and peer-supported engagement/delivery of treatment. The primary endpoint was the proportion initiating HCV therapy.

Results: Among 101 people with recent injecting drug use (median age 43; 31% female), 27% ($n = 27$) were HCV RNA detectable. Treatment uptake was 74% (20 of 27; sofosbuvir/velpatasvir, $n = 8$; glecaprevir/pibrentasvir, $n = 12$). Among people initiating treatment ($n = 20$), 45% ($n = 9$) initiated treatment at the same visit, 50% ($n = 10$) in the next 1-2 days, and 5% on day 7 ($n = 1$). Two participants initiated treatment outside the study (overall treatment uptake 81%). Reasons for not initiating treatment included loss to follow-up ($n = 2$), no reimbursement ($n = 1$), not suitable for treatment (mental health) ($n = 1$), and inability to perform liver disease assessment ($n = 1$). In the full analysis set, 60% (12 of 20) completed treatment and 40% (8 of 20) had a sustained virological response (SVR). In the evaluable population (excluding people without an SVR test), SVR was 89% (8 of 9).

Conclusion: Point-of-care HCV RNA testing, linkage to nursing, and peer-supported engagement/delivery led to high HCV treatment uptake (majority single-visit) among people with recent injecting drug use attending a peer-led NSP. The lower proportion of people with SVR highlights the need for further interventions to support treatment completion.

Introduction

The World Health Organization has set a goal to eliminate hepatitis C virus (HCV) infection as a major public health threat by 2030, with targets to increase HCV diagnoses and treatment, and reduce new infections and liver-related deaths (WHO, 2017). Increasing uptake of HCV testing and treatment is hampered by current diagnostic pathways requiring multiple visits and frequent loss to follow-up, amplified in key populations, such as people who inject drugs (Grebely et al., 2017).

The availability of point-of-care testing for the detection of active HCV infection in one hour has the potential to change HCV clinical management (Grebely et al., 2017). The Xpert HCV Viral Load Fingerstick test has good technical accuracy (Catlett et al., 2022; Grebely et al., 2017; Lamoury et al., 2018), enabling diagnosis and treatment in a

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single-visit, thereby increasing test acceptability (Bajis et al., 2018; Lafferty et al., 2022) and reducing loss to follow-up to address the drop-off in the HCV care cascade. Although studies have evaluated HCV treatment uptake following the implementation of Xpert HCV Viral Load Fingerstick testing (Draper et al., 2021; Grebely et al., 2021; Howell et al., 2022; Macisaac et al., 2021; O'Loan et al., 2021; Ralton et al., 2021; Shilton et al., 2022; Valerio et al., 2021), few studies have evaluated a model which facilitates testing, diagnosis, and treatment in a single-visit [including point-of-care testing for HIV and hepatitis B virus (HBV), and liver disease assessment].

In addition to strategies to enhance testing, interventions are required to enhance engagement and maintenance in care for people with ongoing injecting drug use (Cunningham et al., 2022). Peer-support has been demonstrated to be an important intervention to facilitate HCV testing, linkage to care/treatment, and maintained engagement in care (Crawford & Bath, 2013; Henderson et al., 2017; Jugnarain et al., 2022; Stagg et al., 2019; Treloar et al., 2015; Ward et al., 2019). Peer-support creates an opportunity for inter-connectedness, knowledge sharing, trust, and allows for the introduction of wider psychosocial support mechanisms and avenues for health-promotion (Crawford & Bath, 2013; Greer et al., 2016; Hay et al., 2016; Henderson et al., 2017; Medley et al., 2009; Treloar et al., 2015).

This study presents the results of an interventional cohort study evaluating a single-visit test and treat intervention integrating point-of-care HCV RNA testing, linkage to nursing care, and peer-supported engagement and delivery on the proportion of people with recent injecting drug use initiating HCV therapy at a peer-led needle and syringe program (NSP).

Methods

Study design and participants

In this single centre interventional cohort study, we enrolled participants from a peer-led NSP in Sydney, Australia from September 2019 and February 2021 (TEMPO Pilot Study, ClinicalTrials.gov: NCT03492112) (Study Protocol provided in Supplementary Materials). Study recruitment was halted due to COVID-19 between March-August 2020.

Participants were 18 years or older and had recently injected drugs (self-reported injecting drug use within the last month of enrolment). Females who were pregnant or breastfeeding were excluded. Participants with detectable HCV RNA (>limit of quantification) had to be eligible to initiate direct-acting antiviral (DAA) therapy (sofosbuvir/velpatasvir or glecaprevir/pibrentasvir) and be suitable for NSP-based DAA therapy delivery based on the opinion of the investigator. For participants with detectable HCV RNA, exclusion criteria included any clinically significant condition or history known to contraindicate the use of the prescribed DAA treatment medication or would not be suitable for management within a NSP-based treatment setting; any contraindicated medication in the prescribed DAA treatment medication (sofosbuvir/velpatasvir or glecaprevir/pibrentasvir) product information; cirrhosis (Fibroscan score > 12.5 Kpa); HIV co-infection; or HBV co-infection. The study protocol was revised in November 2020 to allow the inclusion of people with previous DAA treatment experience into the study (although no one fulfilling this inclusion criteria were subsequently enrolled).

This single centre interventional cohort study was developed to inform the implementation and design of a cluster randomised controlled trial to compare point-of-care HCV RNA testing, dried blood spot testing, and standard of care among people who inject drugs attending NSP services (NCT04014179). Prior to the enrolment of the first participants in the TEMPO Pilot Study, we were informed by the National Health and Medical Research Council that the larger randomised controlled trial had been funded (TEMPO). As such, the investigators decided to proceed with only one site for the pilot study to ensure that there were sufficient sites for the larger trial (and named this current study, the TEMPO Pilot Study). Due to this decision to continue with a single site (instead of three), recruitment was closed prematurely, but at the target sample size originally proposed for this site ($n = 101$).

Procedures

The TEMPO Pilot Study was advertised preceding recruitment with posters, cards distributed with injecting equipment, and by word of mouth through interactions with staff at the NSP site. Participants were invited to participate in the study by a peer-support worker who was also a staff member at the NSP service.

Enrolment assessments included peer-administered behavioural questionnaires on tablet computers (demographics, behavioural risk, and HCV history data) and point-of-care HCV RNA testing conducted by the nurse [Xpert HCV Viral Load Fingerstick Assay (Cepheid, Sunnyvale, United States; lower limit of quantification 100 IU/ml, upper limit of quantification 10^8 log10 IU/ml; 100% sensitivity, 100% specificity)] (Catlett et al., 2022; Lamoury et al., 2018). While the HCV RNA test was in progress the nurse also performed point-of-care HIV testing (Alere™ HIV Combo, Abbott Rapid Diagnostics, East Brisbane, Australia), point-of-care hepatitis B surface antigen testing (Alere Determine™ HBsAg, Abbott Rapid Diagnostics, East Brisbane, Australia), and FibroScan transient elastography (FibroScan®, Echosens, Paris, France). All participants were compensated (AUD$30 cash).

A capillary whole-blood sample was collected from participants via a fingerstick (Safety Lancet, Super Blade [Order Number 85.1018], Sarstedt, Nümbrecht, Germany) using procedures recommended by the WHO (WHO, 2010) and collected into a 100-μL minivette collection tube (Minivette POCT 100μl K3E [Order number 17.2113.101], Sarstedt, Nümbrecht, Germany). Immediately following collection, 100 μL of capillary whole blood was placed directly into the Xpert HCV VL Fingerstick assay cartridge (lower limit of quantification of 100 IU/mL; Cepheid, Sunnyvale) for on-site HCV RNA testing. The cartridge was loaded into the GeneXpert instrument which uses real-time PCR (rt-PCR) technology that enables the quantification of HCV RNA levels (Cepheid, 2019). The time to result for Xpert HCV VL Fingerstick testing is 58 minutes. All Xpert HCV Viral Load assay testing were performed on a clinic-based GeneXpert R2 6-colour, 2 module machine (GXII-2-L System, GeneXpert Dx software v4.6a; Cepheid, Sunnyvale) operated as per the manufacturer's instructions (Cepheid, 2019) .

Participants with detectable HCV RNA were offered a clinical assessment with a nurse to assess suitability for DAA therapy and linked to a peer support worker. If required, standard phlebotomy for liver function tests, full blood count, and biochemistry were performed (but were not required for HCV treatment initiation). Participants deemed not suitable for treatment under this simplified model of care were referred for follow-up through standard of care.

Arrangements were put in place with a local pharmacy to facilitate streamlined dispensing of DAA therapy. Following clinical assessment and a decision to initiate DAA therapy, a nurse would contact a physician via telephone to arrange a script and an email would be sent to the pharmacy to allow medication dispensing (with a hard copy of the script delivered the next day). The medication was either directly dispensed to the client at the pharmacy or the nurse or peer would pick up the medication from the pharmacy for collection at the NSP by the client. Co-payment for DAA therapy (AU$7-36 per month) was also covered through the study.

Participants initiating therapy received either a fixed-dose combination tablet that contained 400 mg of sofosbuvir and 100 mg of velpatasvir (administered orally once daily for 12 weeks) or three tablets containing 300 mg of glecaprevir and 120 mg pibrentasvir (administered orally once daily for 8 weeks) (funded through the Australian government reimbursement scheme).

A dedicated peer-based support worker provided peer-led education and engagement. This peer-worker played a critical role in the study

including facilitating health promotion activities, leading engagement in testing as people were accessing the NSP service, provided a bridge between participants and clinical staff at the service, provided expertise and support for the completion of research survey, and provided ongoing support for participants who initiated treatment through weekly communication and follow-up (most often via telephone).

Participants with detectable HCV RNA initiating HCV DAA therapy were further assessed at weeks 4, 8 (for people receiving sofosbuvir and velpatasvir only), and end of treatment (8 or 12 weeks). Following treatment, participants also attended a visit for SVR12 (week 20 or 24). HCV RNA levels for evaluation of SVR12 were measured using the Xpert HCV VL Fingerstick test.

Participants completed a peer-administered questionnaire at screening/enrolment, at the end of treatment (8 or 12 weeks, depending on treatment) and at 12 weeks post-treatment. The questionnaires collected information on demographics (age, gender, employment status, education level, housing status), drug/alcohol use, injecting risk behaviours, and drug treatment. Alcohol consumption was evaluated by the Alcohol Use Disorders Identification Test-Consumption (AUDIT-C), derived from the first three questions of the full AUDIT [scores ≥3 (women) and ≥ 4 (men) indicate hazardous consumption or active alcohol use disorders] (Bush et al., 1998).

Stage of liver fibrosis was assessed by liver stiffness measurement (Transient Elastography [FibroScan®]). For liver stiffness measurements, the chosen cut-offs for significant liver fibrosis was 7.1 kPa and was 12.5 kPa for cirrhosis (Castera et al., 2005).

Outcomes

The primary efficacy endpoint was the proportion of participants who initiated DAA therapy. Secondary endpoints included sustained virological response [SVR12, defined as an HCV RNA level below the limit of quantification 12 weeks after the end of treatment in all participants who received at least one dose of study medication, full analysis set], treatment completion, treatment adherence (calculated by the number of self-reported doses divided by the number of expected doses), end of treatment response (ETR, HCV RNA level below the limit of quantification at the end of treatment), time taken from POC testing to delivery of result to participants, and time taken from notification of a detectable point-of-care test result to the first dose of treatment. Participants with current HCV infection (HCV RNA detectable), previous HCV infection with treatment-induced clearance (HCV RNA undetectable with self-reported history of HCV treatment), spontaneous clearance (HCV RNA undetectable with self-reported previous HCV diagnosis and not having received HCV treatment) and never infected (HCV RNA undetectable and self-reported as never having been diagnosed with HCV) were identified. Participants with no result at or following the SVR12 visit were considered to not have had an SVR. In addition, a *post hoc* analysis was performed excluding participants with a missing SVR12 test (evaluable population).

Statistical analysis

The primary aim of this study was to evaluate the proportion of participants who initiated DAA therapy.

A total of 300 participants were planned for enrolment and evaluation as the full analysis set population. Assuming an estimated prevalence of current HCV (RNA detectable) of 30% (90 of 300), and treatment uptake of 50% (45 of 90), the 95% confidence interval (95% CI) around this estimate was 39% to 61%. Following the revisions to the study design to include a single site, the sample size calculations were updated. Assuming an estimated prevalence of current HCV of 30% (30 of 101), and treatment uptake of 50% (15 of 30), the 95% confidence interval (95% CI) around this estimate (calculated using Clopper–Pearson binomial confidence intervals) would be expected to be 31% to 69%.

We used the Clopper-Pearson method to calculate point estimates and two-sided 95% exact confidence intervals for the proportion with HCV treatment uptake. All analyses were performed using Stata v12.0 (StataCorp, College Station, Texas).

Study oversight

All participants provided written informed consent before study procedures. The study protocol was approved by St. Vincent's Hospital, Sydney Human Research Ethics Committee (primary study committee) and was conducted according to the Declaration of Helsinki and International Conference on Harmonization Good Clinical Practice (ICH/GCP) guidelines. The study was registered with clinicaltrials.gov registry (NCT03492112).

Role of the Funding source

The study was funded by a research grant from a seed grant from the Maridulu Budyari Gumal Sydney Partnership for Health, Education, Research and Enterprise (SPHERE) Triple I Clinical Academic Group. This study was also supported by research grants from Gilead Sciences Pty Ltd and Cepheid (provided GeneXpert platforms and testing). The funders had no role in the study design, data collection, analysis, interpretation of the results, the writing of the report or the decision to submit the report for publication. JG, EC, and GD had access to the raw data. The sponsor (The Kirby Institute, UNSW Sydney) designed the study, collected the data, managed study samples, monitored study conduct, and performed the statistical analysis. JG, GD, and PR were responsible for the decision to submit for publication.

Results

Participant characteristics

Overall, 101 participants were enrolled (Fig. 1). The median age was 43 years, 31% (31 of 101) were female, and 4% (4 of 101) had cirrhosis (Table 1).

At enrolment, 100% (101 of 101) had injected drugs in the previous month, 47% (47 of 101) had injected drugs ≥daily in the previous month, and 27% (27 of 101) were receiving OAT (Table 1). Commonly injected drugs in the previous month included methamphetamines (79%), heroin (55%), other opioids (31%), and cocaine (13%). There were no participants with HIV or HBV infection.

HCV testing

Among 101 participants enrolled and tested for HCV, 98% of participants (99 of 101) had at least one available fingerstick sample and a valid result. Among all 101 samples tested, there were two errors reported by the Xpert equipment (n = 2), one of which was retested at enrolment, providing results for 100 of 101 participants. Overall, 27% (27 of 100) had detectable HCV RNA (>limit of quantification) (no previous treatment, n = 21; previous treatment n = 6). Additionally, 20% (20 of 100) had previous HCV infection with treatment-induced clearance (HCV RNA undetectable with self-reported history of HCV treatment) and 20% (20 of 100) had spontaneous clearance (HCV RNA undetectable with self-reported previous HCV diagnosis and not having received HCV treatment). As such, the estimated antibody prevalence was 67% (67 of 100). Overall, 33% (33 of 100) had never been infected (HCV RNA undetectable and self-reported as never having been diagnosed with HCV).

HCV treatment uptake

Among people with detectable HCV (>limit of quantification), 74% (20 of 27, 95% CI: 54%, 89%) initiated DAA treatment through the

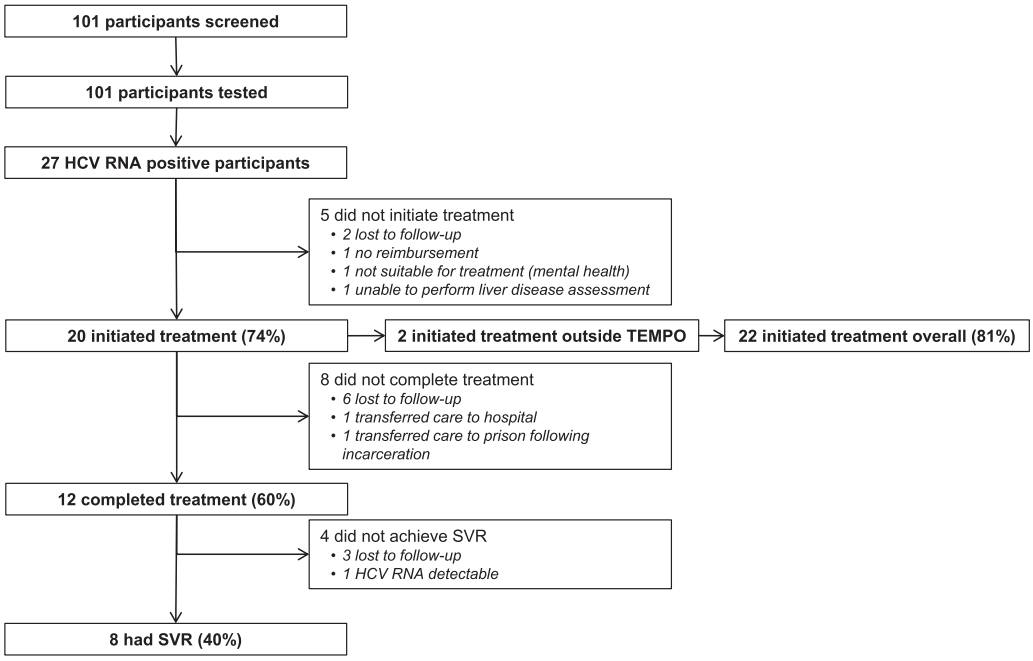

Fig. 1. Study profile.

study. Among these 20 participants, the median age was 48 years, 40% (8 of 20) were female, and 95% (19 of 20) had injected drugs in the previous month. HCV therapy included glecaprevir and pibrentasvir (n = 12) and sofosbuvir and velpatasvir (n = 8). HCV treatment was initiated at the same visit in 45% (9 of 20), the next day in 40% (8 of 20), two days later in 10% (2 of 20), seven days later in 5% (1 of 20). Overall, 95% (19 of 20) initiated treatment within three days of testing. The median time from enrolment to treatment initiation was 1 day (IQR 0-1). Two participants also initiated treatment outside the study (overall treatment uptake 81%, 22 of 27) because they either had previously received DAA treatment (n = 1) or it was not possible to obtain an accurate medical history at the time of study enrolment at the NSP (n = 1).

Reasons for not initiating treatment included loss to follow-up (n = 2), no reimbursement (n = 1), not being suitable for treatment (mental health) (n = 1), and inability to perform liver disease assessment (n = 1).

HCV treatment adherence, completion, and SVR

The overall mean adherence was 91% and the median adherence was 99% (Fig. 2). Among people reporting missed doses (n = 14), the main reasons for missed doses included running out of pills (n = 5, 29%), forgetting to take pills (n = 3, 18%), personal emergency (n = 3, 18%), and hospitalisation (n = 3, 18%). Overall, the peer worker successfully contacted participants on 54% (103 of 192) of weeks (Fig. 2). Patient contacts were generally via phone (49%) or face to face (49%).

In the full analysis set, 60% (12 of 20) completed treatment, 50% (10 of 20) had an ETR and 40% (8 of 20) had an SVR (Table 2). Among those who did not complete treatment within the study (n = 8), reasons for treatment discontinuation included loss to follow-up (n = 6), transfer of care to hospital (n = 1) and transfer of care to prison following incarceration (n = 1). Overall, 25% (5 of 20) of people had discontinued therapy by four weeks. Overall, 50% (6 of 12) completed their intended duration of 8 weeks of therapy and 75% (6 of 8) completed their intended duration of 12 weeks of therapy. Among participants who completed treatment but did not have an SVR (n = 4), reasons for not recording an SVR were loss to follow-up (n = 3) and having detectable HCV RNA at the SVR12 visit (n = 1). In the evaluable population (excluding people without an SVR test), SVR was 89% (8 of 9 with available testing). One person reported as having completed treatment, had HCV RNA detected at SVR12 (n = 1, 11%), but viral sequencing could not be performed to distinguish reinfection from viral relapse. The person was prescribed another DAA regimen at the study site, outside of the TEMPO Study. The proportion with SVR stratified by key characteristics is shown in Supplementary Table 1.

Discussion

This study evaluated a single-visit test and treat intervention integrating point-of-care HCV RNA testing, linkage to nursing care, and peer-supported engagement and delivery on the proportion of people with recent injecting drug use initiating HCV therapy at a peer-led NSP. The overall proportion initiating treatment was 81% (74% at the NSP). Overall, 40% achieved SVR (89% in the evaluable population). These data highlighting the feasibility of implementing a single-visit test and treat intervention with point-of-care HCV RNA testing will guide clinical practice to implement similar models internationally. This study supports health policy by providing evidence to support the inclusion of point-of-care HCV RNA testing in local, national, and international viral hepatitis strategy guidelines.

HCV treatment uptake was 81% in this study, which is higher than population-based estimates of the proportion of people ever initiating HCV treatment following diagnosis (59%) among people with drug dependence (those having received OAT or having been hospitalised for an injecting-related infection) in New South Wales, Australia (Yousafzai et al., 2022). Treatment uptake was also higher than studies using point-of-care HCV RNA testing (23-49% treatment uptake) among people who inject drugs where the results could not be communicated back to participants (at the time of those studies, the test was for research-use only) (Bajis et al., 2020; Conway et al., 2022). The treatment uptake observed in this study is comparable to other studies that have evaluated point-of-care HCV RNA testing in mobile clinics (74%) (O'Loan et al., 2021), supervised consumption facilities (89%) (Macisaac et al., 2021), NSP (63-84%) (Howell et al., 2022; Shilton et al., 2022), community-based settings (79-91%) (Draper et al., 2021; Ralton et al., 2021), and prisons (93%) (Sheehan et al., 2021). The novel aspects of TEMPO Pilot study include the single-visit point-

ID	Planned length of treatment regimen (weeks)	Week 01	02	03	04	05	06	07	08	09	10	11	12	Extended follow-up
079	8	0	0	0	0	0	0		0					
084	8	0			0									
085	8	0	0	0	7	0		0	7					
025	8	0		0	0	0	0							
027	8	0	0	1		0								
035	8	0	0	0										
043	8	0	0	0	0	0	0	0	0					
044	8	2					2		0					
049	8	0		3		0	0	0						
052	8	2	0		2		7	7	7					
058*	8													
071	8	0	0		0	7	0	0						0
074	12	0				0								
077	12	0	1		0		0	0					0	
093**	12													
098**	12													
106	12	0	0	0				0		0				
062	12	0	0	0	0	0	3	0	0	0	0	0	0	
063	12	0	0		0			1		7	7	0	0	0
047	12	0	0	0	0	0		0	0	0	0	0	0	

*Incarcerated from Week 1. **No telephone.

0 missed doses
1 missed dose
2 missed doses
3 missed doses
4 missed doses
5 missed doses
6 missed doses
7 missed doses
Unsuccessful contact

695
696
697
698
699
700
701
702
703
704

Fig. 2. Heat diagram of successful patient contact attempts by peer support worker and the patient-reported adherence recorded during that contact.

of-care HCV RNA testing and treatment model, the use of point-of-care testing for HIV/HBV, the nurse-led model of care, and the inclusion of peer-based engagement in testing and support during treatment at a peer-led NSP. Despite the need to wait for an hour for point-of-care HCV RNA results, 45% initiated HCV treatment in the same visit and 95% initiated treatment within three days of testing. An opportunity to further improve acceptability and efficiency of detecting people suitable for same-visit treatment could include the use of point-of-care HCV antibody testing followed by point-of-care HCV RNA testing (for those HCV antibody positive). Point-of-care HCV RNA testing is more expensive than point-of-care HCV antibody testing (AU$60 vs. $10) and has a longer time to result (60 mins for an RNA result vs. 1-20 mins for a negative HCV antibody result and 1-5 mins for a positive HCV antibody result). Combining point-of-care HCV antibody and RNA testing could optimise testing, enhancing cost-effectiveness and acceptability, with potentially no impact on effectiveness (HCV treatment uptake/cure).

The high HCV treatment uptake in this population of people with recent injecting drug use is likely due to a combination of factors. First, the offer of fingerstick point-of-care HCV RNA testing and treatment (facilitated by point-of-care HIV/HBV testing) in a single-visit is likely to have increased acceptability and reduced loss to follow-up. Given issues of poor venous access and difficulties in the collection of blood by venepuncture, people who inject drugs have a preference for fingerstick testing compared to venepuncture and prefer to receive results in a single-visit (Bajis et al., 2018). On-site testing and point-of-care antibody testing are also associated with increased testing and treatment uptake (Cunningham et al., 2022). Second, this model included a nurse-led model of care with integration of care within the peer-led NSP. Integrated care is associated with increased linkage to care and treatment uptake (Cunningham et al., 2022). Lastly, the model included peer-based engagement in testing and support during HCV treatment. This included a strong relationship between the peer and the nurse who provided complimentary knowledge and expertise. Community-led peer-based interventions enhance testing/treatment for HCV, blood borne viruses, and STIs (Hay et al., 2016; Jugnarain et al., 2022; Medley et al., 2009; Stagg et al., 2019). Peers (persons with equal standing in a particular community who share a common lived experience) (Greer et al., 2016) are more likely to trust information from a peer with credibility in their network (AIVL, 2006). Peers are more likely to listen to someone they respect, has direct personal experience of drug use or HCV, and see themselves as equals in peer groups (Henderson et al., 2017; Kelsall & Kerger, 2001; Madden et al., 2002). Community-led organisations representing people living with HCV and people who use drugs are critical for engaging and supporting people to receive testing/treatment. Fur-

Table 1
Baseline characteristics.

Variable	Overall (n = 101)
Age, median years (IQR)	43 (37-47)
Female gender	31 (31%)
High school or higher education	38 (38%)
Homeless	17 (17%)
Employment	38 (38%)
Full-time employment	2 (2%)
Part-time employment	5 (5%)
Government assistance	94 (93%)
Injecting drug use in the previous month	
Heroin	56 (55%)
Cocaine	13 (13%)
Methamphetamines	80 (79%)
Other opioids	31 (31%)
Incarceration	
Recent	21 (21%)
Ever	50 (50%)
Never	30 (30%)
Injecting drug use frequency in the previous month	
Never	4 (4%)
<daily	50 (50%)
≥daily	47 (47%)
Hazardous alcohol use in the previous month	41 (41%)
Current OAT	
No	74 (73%)
Yes, methadone	18 (18%)
Yes, buprenorphine	9 (9%)
HCV RNA, log IU/mL median (IQR)**	5.8 (5.05-6.20)
Stage of liver disease	
No or mild fibrosis (F0-F1)ǂ	80 (80%)
Moderate or advanced fibrosis (F2-F3)ǂ	17 (17%)
Cirrhosis (F4)ǂ	4 (4%)

Data are n (%), or median (IQR). High school = completing 13 years of schooling. OAT=opioid agonist therapy. *Homelessness was defined as spending majority of nights in the last month in no usual residence, a shelter or squat. ‡F0–F1 <7·1 kPa, F2–F3 7·1–12·49 kPa, F4 ≥12·5 kPa. **among 27 participants with detectable HCV RNA.

ther work is needed to understand how best to support the peer workforce and facilitate the scale-up of peer-based approaches to facilitate engagement in HCV care.

The proportion with SVR in the full analysis set was 40% in this study, which is lower than a systematic review of HCV treatment response among people with recent injecting drug use (87%) (Hajarizadeh et al., 2018). However, the SVR among those who returned for their SVR test was 89%. Among those who initiated therapy, 25% discontinued therapy by four weeks, despite continued efforts for engagement through the peer worker and the nurses. The high proportion with treatment discontinuation is a limitation to the study and highlights the importance of further studies to investigate SVR following test and treat strategies. Lastly, it is also worth considering implementing testing at four weeks following the completion of therapy (SVR4) to increase the proportion with available HCV RNA testing, given data demonstrating that SVR4 performs comparably to SVR12 with DAA therapies (Gane et al., 2021). Collectively, these data suggest that strategies should be explored to improve retention and facilitate HCV treatment completion, particularly among people with recent injecting drug use who may require enhanced support during therapy.

This study has limitations. Given that participants were recruited from one peer-based NSP program in Sydney, Australia, with experience in providing HCV care, the results of this study may not be generalizable to all populations of PWID, and to all HCV treatment settings. Unfortunately, information on the number of PWID approached for this study was not collected, so it was not possible to assess the reach of the study in terms of the proportion of people who were approached and accepted HCV testing. Further, participants received a AUD$30 cash reimbursement at all study-related visits, which may have provided additional incentive to remain for testing and return for follow-up and led to an increased treatment uptake in the study. That being said, it is encouraging that the treatment uptake in this study is consistent with other studies evaluating point-of-care HCV RNA testing (Draper et al., 2021; Howell et al., 2022; Macisaac et al., 2021; O'Loan et al., 2021; Ralton et al., 2021; Sheehan et al., 2021; Shilton et al., 2022), including at NSPs (Howell et al., 2022; Shilton et al., 2022). It should also be noted that this study was discontinued prematurely due to a decision to continue with a single site (instead of three), and recruitment was closed prematurely (101 instead of 300 participants). This limited the number of participants recruited into the study and resulted in a smaller than anticipated sample size and limited the power to investigate factors associated with SVR (which is why these results are presented only descriptively).

The findings from this study have important clinical, research, and policy implications. The demonstration that a single-visit point-of-care HCV RNA testing and treatment model is feasible has the potential to

Table 2
Treatment completion, end of treatment response, and sustained virologic response among people who initiated treatment (n = 20).

ID	Completed treatment	If no treatment completion, why?	Achieved ETR¥	If no ETR, why?	Achieved SVR12¥	If no SVR, why?
079	Yes		Yes		Yes	
084	No	LTFU	-		-	
085	No	LTFU	-		-	
025	No	LTFU	-		-	
027	Yes		No	HCV detected	No	HCV detected
035	Yes		Yes		Yes	
043	Yes		Yes		Yes	
044	No	LTFU	-		-	
049	Yes		Yes		Yes	
052	No	LTFU	-		-	
058	No	Incarcerated	-		-	
071	Yes		No	LTFU	-	
074	No	LTFU	-		-	
077	Yes		Yes		Yes	
093	Yes		Yes		No	LTFU
098	Yes		Yes		No	LTFU
106	Yes		Yes		Yes	
062	Yes		Yes		Yes	
063	No	Hospitalised	-		-	
047	Yes		Yes		Yes	

Acronyms: ETR – end of treatment response. SVR – sustained virologic response. LTFU - lost to follow-up.
¥ Hyphen (-) indicates no information available.

guide clinical practice for point-of-care HCV RNA testing for management of HCV infection. This includes guidance around how point-of-care testing is integrated into health service delivery, the use of point-of-care HIV/HBV testing, and liver disease assessment. Preliminary data from the TEMPO Pilot study have been critical in advocating for investment by the Australian Department of Health in a National Australian HCV Point-of-Care Testing Program (AU$6.5 million) (Grebely et al., 2023). Government funding supports program implementation (training, quality assurance program, testing, equipment and IT/connectivity), while funding from a National Health and Medical Research Council Partnership Grant (including Cepheid and Gilead Sciences) supports research evaluating point-of-care HCV RNA testing scale-up. The program is establishing >90 sites nationally with plans to test 50–60,000 people for HCV between 2022-2024 at a range of services, including drug treatment clinics, NSPs, prisons, mental health, mobile outreach models, homelessness services, Aboriginal and Torres Strait Islander Community Controlled Health Organisations (Grebely et al., 2023). The preliminary data from the TEMPO pilot study have also informed the development of the larger TEMPO Study (clinicaltrials.gov, NCT04014179), a cluster randomised trial comparing point-of-care HCV RNA testing, dried blood spot testing, and standard of care as strategies to enhance HCV treatment uptake among people with recent injecting drug use attending NSP services. Specifically, this pilot study provided information on the feasibility and rate of study recruitment, informing clinical operations and timelines for the larger TEMPO study. Also, a higher proportion initiating HCV treatment was observed compared to initial estimates (81% vs. 50%) which led to revisions in the study design for the larger TEMPO study (including reducing the number of clusters required). Although the National Australian HCV Point-of-Care Testing Program has received funding and is now operational, a randomised controlled trial comparing HCV point-of-care testing, dried blood spot testing, and standard of care among PWID attending NSPs with embedded health economic evaluation will provide critical information on the effectiveness, acceptability, and cost-effectiveness of the most effective testing strategy in NSP settings. Lastly, data from the TEMPO Pilot study has informed the integration of point-of-care HCV RNA testing into state-based and national strategies and has the potential to inform other normative guidance internationally.

In conclusion, the TEMPO Pilot study provides proof-of-concept data of the feasibility of a single-visit test and treat intervention integrating point-of-care HCV RNA testing, linkage to nursing care, and peer-supported engagement and delivery among people with recent injecting drug use initiating HCV therapy at a peer-led NSP. Although the proportion of people who achieved SVR was lower than previous studies, the proportion who achieved cure among those who returned for follow-up was high. A major limitation of this study was the small sample size, thereby limiting the conclusions that can be drawn from these data. Further research is needed to evaluate the potential of point-of-care HCV RNA testing and other testing modalities (e.g. dried blood spot testing and point-of-care antibody testing) as potential strategies to simplify and enhance HCV testing, linkage to care, and treatment. This includes understanding the barriers to and acceptability of uptake and integration of point-of-care HCV RNA testing in different services for people who inject drugs. Understanding the effectiveness, acceptability, implementation challenges, and cost-effectiveness of different point-of-care testing strategies and other interventions to improve treatment completion and retention will be critical to inform implementation, funding, and integration into policy and practice to achieve HCV elimination as a major global public health threat.

Ethics approval

The authors declare that they have obtained ethics approval from an appropriately constituted ethics committee/institutional review board where the research entailed animal or human participation.

The study protocol was approved by St. Vincent's Hospital, Sydney Human Research Ethics Committee (primary study committee, ethics number 18/088) and was conducted according to the Declaration of Helsinki and International Conference on Harmonization Good Clinical Practice (ICH/GCP) guidelines.

Declarations of Interest

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Data Availability statement

The individual deidentified participant data (including data dictionaries) that support the findings of this study (text, tables, figures, and appendices) are available from the corresponding author upon reasonable request. The study protocol is included as Supplementary Material and the study is registered at ClinicalTrials.gov: NCT03492112. Data may be requested from the corresponding author by email (with an appropriate plan for the use of data) by investigators to perform individual-level meta analyses that has been approved by an independent review committee identified for this purpose. Proposals may be submitted immediately following publication.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.drugpo.2023.103982.

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