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Implementing a peer-supported, integrated strategy for substance use disorder care in an outpatient infectious disease clinic is associated with improved patient outcomes

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Abstract

Background: Substance use disorder (SUD) and infectious disease (ID) care integration may lead to improvements in SUD and ID outcomes. We assessed implementation of integrating peer-supported SUD care in an outpatient ID setting.

Methods: In this implementation study, we describe REcovery in Specialty care Through medication and OutREach (RESTORE), a low-threshold SUD program implemented in a Baltimore outpatient ID clinic. Key program components were clinician training and support in SUD care, prescription of SUD treatment medications, and peer-based psychosocial support provided by peer recovery specialists. We assessed clinician adoption of RESTORE and compared patient outcomes from baseline to 6 months.

Results: Between January 2019 and January 2022, the number of ID clinicians (N=61) who prescribed buprenorphine increased eightfold from 3 (5%) to 24 (39%). Of 258 ID patients referred to RESTORE, 182 (71%) engaged, 137 consented to study participation. Mean age in the

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study sample was 52.1 (SD=10.4), 63% were male, 84% were Black/African-American. Among 127 (93%) who completed 6-month follow-up, fewer participants reported illicit/non-prescribed opioid use in the past 30 days at follow-up (32%) compared to baseline (52%; p<0.001). Similar reductions were noted for cocaine use (47% to 34%; p=0.006), emergency department visits (23% to 9%; p=0.002), and inpatient hospitalizations (15% to 7%; p=0.025).

Conclusion: SUD care integration into an outpatient ID care setting using a peer-supported implementation strategy was adopted by clinicians and improved clinical outcomes for patients. This strategy is a promising approach to treating people with infectious diseases and SUD.

Keywords

Infectious Disease; Substance Use; Care Integration; Implementation

Introduction

The global opioid crisis has led to concomitant increases in injection drug use (IDU) and incident rates of HIV, hepatitis C virus (HCV), hepatitis B virus (HBV), and other injection-related infections (Degenhardt et al., 2023; Schwetz et al., 2019; Zibbell et al., 2018). An estimated 14.8 million people were injection drug users globally 2017–2022, and 15.2% of people who injected drugs were living with HIV and 38.8% had current HCV infection (Degenhardt et al., 2023). In the U.S, there were 66,700 estimated cases of acute HCV in 2020, twice the incident HCV rate compared to 2013 (Centers for Disease Control and Prevention, 2022). Among incident HCV cases with risk factor indicated, 67% were in people who inject drugs. Among individuals with HCV or HIV, alcohol and other substance use are associated with infectious disease (ID) progression, delayed care, poor adherence to treatment, lack of HIV viral suppression, and reduced uptake of HCV treatment (Azar et al., 2015; Lesko et al., 2021), leading to increased morbidity, mortality, and healthcare costs (Coyle et al., 2020; Kangethe et al., 2019).

Evidence-based SUD treatments such as buprenorphine and methadone for opioid use disorder (OUD) and extended-release naltrexone for alcohol use disorder (AUD) may be effective in reducing illicit opioid use, opioid-related death and all-cause mortality, and improving quality of life (Altice et al., 2011; Lucas et al., 2010; Mattick et al., 2014; Santo et al., 2021; Sordo et al., 2017). Further, these medications are associated with reductions in HIV and HCV risk and transmission, improved uptake of HCV and HIV treatment, retention in HIV care, and higher rates of HIV virologic suppression (Kim et al., 2021; Korthuis et al., 2017; Low et al., 2016; Lucas et al., 2010; MacArthur et al., 2012; Norton et al., 2017; Platt et al., 2017). However, care for infectious diseases is often siloed from care for SUD, limiting access to SUD and ID care for people who use drugs (PWUD). In a 2020 report, the National Academies of Science, Engineering, and Medicine recommended integrating substance use and ID care as an approach to improving health outcomes for PWUD (Springer et al., 2020).

Despite data supporting improved outcomes of integrated ID and SUD care (Korthuis et al., 2017; Lucas et al., 2010; Rosenthal et al., 2020), a key gap is lack of consistent screening and treatment for SUD in ID clinics (Springer et al., 2020). Barriers to SUD care provision

in ID care settings include lack of clinician comfort with screening for and addressing SUD, a prior requirement for a waiver for buprenorphine prescription (eliminated in the U.S. in December, 2022), lack of familiarity with pharmacologic treatment options for AUD or OUD, and limited time for counselling on or initiation of substance use treatment or counselling to support substance use recovery (Cunningham et al., 2007; Pinto et al., 2019). Few studies have evaluated the routine integration of SUD care in HIV or other infectious disease care settings. A recent study evaluated implementation facilitation across 4 HIV clinics in the US and utilized a multifaced intervention including external facilitation by substance use and implementation science experts, involvement of a local champion at the clinic, education of front line clinicians, performance monitoring and feedback at the program level, a learning collaborative of clinic providers conducted through monthly video conferences and program marketing to increase awareness and facilitate patient-clinician discussions of SUD treatment(Edelman et al., 2020). Implementation facilitation was associated with an increase in provision of medications for alcohol use disorder but no increase in provision of medications for opioid use disorder in this study (Edelman et al., 2022). Implementation strategies defined as “approaches to facilitate the adoption, implementation and sustainability of evidence-based interventions into routine clinical care are needed for SUD care integration into and ID care settings (Parcesepe et al., 2020; Powell et al., 2015).

The primary objective of this study was to describe and assess implementation of a low-threshold SUD care program in an ID outpatient care setting. Our definition of low-threshold care utilizes the framework by Jakubowski et al. for buprenorphine treatment guided by key principles of same-day SUD treatment initiation, a harm reduction approach, flexibility, and availability of SUD care in settings accessible to PWUD (Jakubowski & Fox, 2020). We additionally examined clinical outcomes over time among ID patients who received SUD care services.

Methods

Study design

This observational study 1) describes the implementation of a model for low threshold SUD care integration into an infectious disease care setting and 2) presents implementation outcomes and patient outcomes from a longitudinal cohort study that evaluated patient outcomes over 6 months.

Study setting

The John G. Bartlett Specialty Practice (Bartlett Clinic) is an academic, multidisciplinary ID care clinic within the Johns Hopkins Hospital in Baltimore, MD and provides HIV, viral hepatitis, and general ID outpatient care to approximately 4000 patients annually. Bartlett provides onsite phlebotomy, HCV and HIV counseling, testing, and treatment services, pre-exposure prophylaxis (PrEP) for HIV prevention, psychiatric care, social work and case management, and pharmacy services. Care is provided by clinicians, nurses, and case managers with assigned patient panels.

Implementation framework

This single-site implementation program followed Chamberlain's Stages of Implementation Completion (Chamberlain et al., 2011) utilizing pre-implementation (engagement, feasibility consideration, readiness planning) and implementation (staff hiring and training, service provision, ongoing service provision) phases. The stages of implementation Completion was selected as it provides an appropriate framework to observe and track completion of key implementation milestones of strategies implemented into routine clinical care (Chamberlain et al., 2011).

Pre-implementation

Engagement

Engagement activities included 3 meetings with Bartlett leadership and clinicians to assess need for integrating low-threshold SUD services and potential funding sources. A needs assessment survey was developed based on barriers to integrating SUD and ID care identified in the literature and included questions on provider current SUD screening practices, comfort level in identifying and managing OUD in patients, whether providers have obtained a buprenorphine x-waiver (required for prescribing buprenorphine at the time of implementation) and prescribed buprenorphine, feelings about prescribing buprenorphine and integration of SUD care into routine HIV care , and barriers to SUD care integration with ID care. Among 42 providers who completed the survey majority (74%) self-reported comfort with screening for SUD, while only 12% reported confidence in their ability to treat patients with SUD. The minority (5%) had ever prescribed buprenorphine. The major barriers to SUD care identified by providers were lack of onsite addiction counseling support (78%) and insufficient support for addiction care (51%).

Initial model and feasibility consideration

The RESTORE program was structured to address barriers of limited comfort with and support for SUD care identified in the needs assessment. Following model creation, meetings were conducted with stakeholders across the clinic to discuss feasibility.

Readiness planning

Readiness planning included cataloging existing Johns Hopkins and community SUD resources, building partnerships among key stakeholders, planning for hiring and staff supervision, and finalizing the implementation plan. An assessment of clinic workflow and electronic medical record (EMR) SUD screening processes was performed. Roundtable discussions were held separately for clinicians, nurses, medical assistants, and front desk staff to orient clinic personnel to the chronic disease model for SUD treatment. Given limited clinician experience with SUD care, local expertise to support SUD treatment integration efforts and available community referral resources were identified.

Implementation

The REcovery in Specialty care Through medication and OutREach (RESTORE) model

Overview—RESTORE was designed with a primary aim of increasing the number of patients with infectious diseases who are screened for and receive evidence-based treatment for SUD. Implementation strategies were mapped to those identified by Waltz et al. (Waltz et al., 2015) and included clinician training and support, ongoing consultation, local technical assistance and care facilitation to clinicians and care engagement support to patients. Implementation strategies were specified per Proctor (Proctor et al., 2013) (see Table 1).

The primary RESTORE implementation team members included: (a) a "clinician champion", an experienced HIV clinician who supported SUD integration into the ID care setting, provided direct SUD care, guided other clinicians in SUD management, and supervised RESTORE staff and (b) peer recovery specialists, community members with lived experience of substance use who were integrated into the healthcare team and worked with patients to support engagement in SUD treatment. Additionally, an addiction psychiatrist and therapist (existing clinic clinicians) were integrated into the RESTORE team to review clinical cases with the primary implementation team and provide specialized SUD care guidance. The RESTORE team met weekly to review new referrals from Bartlett ID clinicians to RESTORE, monitor patient progress, and define/refine individual SUD treatment plans (Table 1).

An ongoing initiative of the Baltimore City Health Department utilizing Vermont's Hub and Spoke model for opioid treatment (Brooklyn & Sigmon, 2017) provided access to specialized support from SUD clinicians in a Baltimore City Opioid Treatment Program (OTP) serving as a Hub (source of SUD expertise) and Bartlett serving as a Spoke (recipient of SUD care technical assistance). This collaboration allowed for expert addictions consultation by OTP physicians with ID clinicians and workflows to facilitate referrals to higher levels of SUD care at the OTP.

Implementation Staffing—The primary implementation team included a clinician champion and 2 peer recovery specialists

Implementation team training: Primary implementation team members (clinician champion and peers) completed the interactive case-based American Society for Addiction Medicine Project ECHO training: Fundamentals of Addiction Medicine on best practices in SUD care (ASAM, 2023). Team members also completed a half-day in-person motivational interviewing training provided by an expert consultant.

Implementation team roles

Clinician champion: An ID clinician with interest in SUD care received salary support to develop additional expertise in SUD care, lead program implementation and systems development, provide clinician support for initiation of pharmacologic agents for SUD treatment, and provide direct SUD care. The champion supervised and guided peer recovery specialists to work effectively in a professional medical environment, and to function as members of a multidisciplinary healthcare team.

Peer recovery specialists: Clinicians were further supported in the provision of SUD care and received interactive assistance through facilitation of ID patient linkage to SUD treatment by peer recovery specialists (peers). Peers provided recovery support to patients, coordinated SUD care, and encouraged treatment retention via motivational interviewing and harm reduction approaches. Peers engaged patients through face-to-face visits, phone calls, and text messaging with once-weekly contact. Through establishing supportive relationships, peers motivated patients to adhere to treatment, encouraged attendance at clinic appointments, and linked patients to clinic resources (i.e., transportation, housing and food resources) when needed.

Infectious Disease Clinician training: To address clinician barriers of limited knowledge and comfort with identifying and treating SUD, the RESTORE model utilized training and ongoing consultation. An eight hour in-person buprenorphine waiver training was organized in collaboration with the American Society for Addiction Medicine. Clinicians across the hospital system were invited to the training. Clinicians were not compensated for completing the training but were able to complete the training during work hours. Additional online SUD care modules available through the providers clinical support system (PCSS), a U.S. SUD training and clinical mentoring project, were also shared with clinicians through clinic email blasts. SUD care didactics and case presentations were provided quarterly at HIV clinician clinical meetings

Service provision: RESTORE services at Bartlett began in January 2019. The program was advertised at clinician meetings, staff meetings, and by word-of-mouth. Any Bartlett patient with substance use including hazardous alcohol use was eligible for RESTORE services. Referrals to RESTORE could be made by any member of the clinic staff. Clinicians were encouraged to use EMR prompts for routine SUD screening and documentation and were given modifiable templates for documenting SUD evaluation and treatment as part of routine encounter notes. When clinic staff identified patients with hazardous substance use, they were encouraged to refer them to RESTORE for further SUD support, including psychosocial support from peers. Referral pathways included direct phone calls to peers, EMR messaging, or secure email to the clinician champion or program peers. Medications for SUD (buprenorphine, naltrexone, acamprosate) could be prescribed as appropriate by either the RESTORE clinician champion or the patient's ID clinician determined at the discretion of the treating ID clinician depending on comfort level and time. Clinicians were given a one-page guide for prescribing sublingual buprenorphine/naloxone, a clinic-patient contract delineating expectations for buprenorphine through office based opioid treatment (OBOT), and a handout for patients for safe home initiation of buprenorphine. All patients with SUD were prescribed intranasal naloxone and trained on overdose response and mitigation. On-site pharmacy services permitted same-day dispensing of buprenorphine.

Peers maintained at least weekly contact with patients newly engaged in SUD recovery and carried a dedicated cell phone for real-time access by patients and clinic staff during clinic hours. Peer-patient encounters included appointment reminders, overdose mitigation training, and communication of treatment team recommendations. Peers provided a "warm handoff" to higher level specialized SUD care (inpatient treatment) when the treatment team

determined a patient's SUD required more intensive treatment. They accompanied patients to offsite specialized SUD treatment intake appointments and maintained communication throughout care, allowing for RESTORE to resume SUD management when appropriate. Optional group therapy was provided by the peers, supervised by the team therapist. RESTORE services are ongoing at Bartlett and available during clinic hours.

COVID-19 adaptations: On March 12, 2020, responding to the COVID-19 pandemic, Bartlett suspended most in-person care. Clinical encounters, recovery groups, and peer services were transitioned to telemedicine, weekly phone-based peer-support calls, and text messages. Patients receiving monthly extended-release naltrexone continued to receive in-person injections and the pharmacy remained open. Federal regulatory changes allowed remote OUD assessment and initiation of buprenorphine via telemedicine. RESTORE continued to accept new referrals and provide treatment and recovery support services via telemedicine. Clinic laboratory services resumed on July 13, 2020, with in-person visits resuming at 50% by November 1, 2020 and 100% by March 1, 2021.

Study Participants

Participants

Bartlett Patients who were receiving RESTORE services January 1, 2019-July 31, 2021 were eligible for study participation. Patients who lacked the capacity to consent were excluded. The Johns Hopkins University School of Medicine Institutional Review Board approved the study protocol and each participant provided informed consent.

Procedures

RESTORE patients were approached about study enrollment at clinical care visits. Study staff screened patients for eligibility and obtained written informed consent. If participants were unable to meet with staff in person, oral consent was obtained by phone. A baseline interview was conducted within 1 month of RESTORE enrollment which asked participants to answer questions about demographics, education, employment, substance use and treatment, risky injecting behaviors, physical and mental health, and lifetime and recent overdoses. Six-month follow-up interviews were conducted July 2019-January 2022. Baseline and follow-up interviews took an average of one hour to complete and participants were given $20 gift cards for completing each interview.

Outcomes

The primary outcomes were clinician adoption of RESTORE services, patient clinical outcomes, and perception of appropriateness of the implementation strategy. Clinician adoption was measured by the proportion of ID clinicians who: (a) received a buprenorphine waiver (obtained from training records); (b) prescribed buprenorphine at least once January 2019 through July 2021 (obtained from pharmacy records); or (c) referred patients to RESTORE (obtained from referral tracking logs). Patient engagement in SUD care was defined as interaction with a RESTORE team member for treatment or recovery services on two or more occasions as recorded on patient contact logs. Clinical outcomes were measured using self-report survey data collected at baseline and 6 months and EMR

chart extraction. Demographic data (baseline only), recent (past 30-day) substance use, emergency department (ED) visits, inpatient admissions, and overdoses (past 90 days) were self-reported at baseline and 6-months using interviewer-administered surveys comprising all questions in the Center for Substance Abuse Treatment Government Performance and Results Act Client Outcome Measures for Discretionary Programs. Depression was assessed using the Patient Health Questionnaire-2 (PHQ-2) with a score ≥3 indicating probable major depressive disorder (Kroenke et al., 2003). Anxiety was assessed using the Generalized Anxiety Disorder questionnaire (GAD-7) with a score of ≥10 indicating probable generalized anxiety disorder (Spitzer et al., 2006). Hazardous alcohol use in the past 12 months was determined by a score ≥8 on the Alcohol Use Disorders Identification Test (AUDIT) (Babor et al., 1989). Historical and current AUD, OUD, and cocaine use disorder diagnoses were obtained through EMR chart extraction. HIV and HCV ribonucleic acid (RNA) laboratory tests conducted as part of routine ID care were extracted from the EMR. Self-report survey items measuring intervention appropriateness were added to the study survey 16 months into implementation.

Statistical analysis

Differences between baseline and 6-month patient outcomes were assessed using McNemar's test of paired nominal data for dichotomous outcomes and t-tests for continuous outcomes. All analyses were conducted using Stata version 17.0 (StataCorp, 2021).

Results

Implementation Outcomes

Clinician adoption—Among 61 Bartlett ID clinicians, 27 (44%) had completed buprenorphine waiver training as of July 2021, increasing the number of buprenorphine-waivered clinicians from 6 to 27 after implementation. Of the 27, 24 (89%) prescribed buprenorphine at least once, an eightfold increase from 3 (5%) to 24 (39%) of Bartlett clinicians pre-implementation. Among 61 clinicians, 46 (75%; 37 MD/DO, 9 NP/PA) referred at least one patient to RESTORE.

Patient engagement / Reach—In the first two and a half years of program implementation, 258 unique patients were referred to RESTORE by Bartlett clinicians. Of these patients, 182 (71%) engaged in SUD care. Among engaged individuals, 137 (75%) provided consent for data for use in research. Ten participants were lost to follow-up, resulting in 127 (93%) participants included in the paired comparison of baseline and 6-month outcomes.

Appropriateness—Among 92 participants in follow-up at the time of introduction of new survey questions assessing intervention appropriateness, 81 participants provided a response to the question "What does RESTORE do that is helpful to you?" The majority of participants (72%) responded "just knowing someone cares," followed by phone calls from peers (54%). Additional helpful aspects of RESTORE were: providing SUD medications (32%); appointment reminders (30%); group sessions (22%); and linkage to higher levels of care (14%).

Patient demographic and clinical outcomes

Among 137 patients engaged in RESTORE who consented to data use and completed a baseline survey, the sample was predominantly male (63%) and Black/African-American (84%) with a mean age (SD) of 52.1 (10.4); half (53%) had a high school diploma/GED (Table 2). Most were receiving care for HIV infection (74%). In the 30 days prior to baseline, half the sample (51%) reported use of any illicit/non-prescribed opioids, 48% used cocaine, and 36% used marijuana. The mean (SD) days of any illicit substance use in the 30 days before baseline was 10.5 (10.9) with 13% of patients reporting IDU. Nearly half (47%) reported ever overdosing and 12% reported an overdose in the preceding 90 days. About a third (39%) met criteria for hazardous alcohol use.

In the total baseline sample of 137 patients, 78 (57%) reported initiating a medication for SUD at baseline through RESTORE with 71 (91%) of these participants taking buprenorphine for OUD, including 1 taking extended-release buprenorphine; 6 participants (8%) received extended-release naltrexone (3 for OUD, 3 for AUD), 1 each (3%) received disulfiram and acamprosate for AUD. Of 104 participants with an OUD diagnosis, 74 (71%) initiated a medication for OUD (71 buprenorphine, 3 extended-release naltrexone) through RESTORE at baseline.

Ten of 137 participants were lost to follow-up at 6 months. Among the 127 (93%) participants in the paired sample who completed both a baseline and 6-month follow-up, 71 patients were receiving medications for SUD through RESTORE at baseline. At 6 months, 52 of the 71 patients (73%) reported receiving MAT (43 buprenorphine, 4 methadone, 4 naltrexone, 1 acamprosate), including 37 (52%) who remained on medications through RESTORE and 15 (20%) receiving MAT in other community based settings. Of the 65 participants in the paired sample who had reported receiving buprenorphine through RESTORE at baseline, 46 (71%) were still receiving MAT at 6 months, including 33 (51%) receiving buprenorphine through RESTORE, 9 who had transferred to other buprenorphine programs, and 4 who had transferred to methadone treatment programs. An additional 8 participants who did not report receiving medications for SUD through RESTORE within 1 month of RESTORE enrollment initiated buprenorphine through RESTORE prior to their 6-month follow-up, totaling 45 participants receiving SUD medications through RESTORE at 6 months.

At 6-month follow-up, there were significant reductions in opioid (52% to 32%; $p<0.001$) and cocaine use in the preceding 30 days (47% to 34%; $p=0.006$) compared to baseline (Table 3). Additionally, there were reductions in the proportion of participants reporting overdose (14% to 2%; $p=0.002$) and hazardous alcohol use (29% to 17%; $p<0.001$) in the past 90 days. Findings were similar for those with a diagnosis of OUD (Supplementary Table 1). The proportion of participants meeting criteria for probable generalized anxiety disorder decreased significantly from baseline to 6 months (27% to 10%; $p=0.004$), but there was no significant change in meeting criteria for probable major depressive disorder (25% to 22%; $p=0.480$). Significant reductions were noted in ED visits in the preceding 30 days from 23.0% at baseline to 9% at 6 months ($p=0.002$). Additionally, there was a significant reduction in hospital admissions from baseline to 6 months (15% to 7%; $p=0.025$).

Among 102 participants with HIV infection, 67 (68%) had paired HIV RNA data in the EMR. The proportion with an HIV RNA <20 copies/ml increased significantly from 55% at baseline to 69% at follow-up (p=0.039; Table 4). Similarly, among 31 of 47 (66%) participants receiving HCV care at Bartlett with paired data available, the proportion with undetectable HCV RNA with HCV treatment initiation increased from 32% at baseline to 81% at 6-month follow-up (p<0.001).

Discussion

Infectious disease care for individuals with SUD is often impeded by inadequate management of co-existing SUD. Integrated SUD and ID care improves health outcomes but few integrated SUD/ID care strategies exist that have potential for sustainability in real world settings. We found that implementation of the RESTORE model was associated with substantial adoption by clinicians and patient engagement. Training and ongoing support for SUD screening and care was associated with increased rates of buprenorphine prescription by infectious disease clinicians. In addition, the availability of integrated low threshold SUD care within the outpatient ID care setting with peer support for engagement in SUD care was also associated with improved ID care outcomes for patients accessing ID care in this outpatient setting. Moreover, most patients found RESTORE to be helpful and they achieved significant and clinically meaningful decreases in substance use, anxiety symptoms, hospitalizations, and ED visits, as well as improved HIV and HCV outcomes over the study period.

The RESTORE program was implemented at a time when clinicians in the US were required to complete 8 hours (physicians) or 24 hours (nurse practitioners and physician assistants) of training on evaluation and management of OUD prior to registering to receive an X waiver for prescription of buprenorphine. Recent U.S. federal regulations have eliminated the requirement for an X waiver for buprenorphine prescription by Drug Enforcement Administration (DEA) licensed clinicians (SAMHSA, 2023). This change removes a major barrier to buprenorphine prescription by clinicians. However, given previous data from April 2017 to January 2019 demonstrating that among 55,938 X-waivered US clinicians only 50.9% wrote at least 1 buprenorphine prescription, implementation strategies like those described in this manuscript will be required to meet OUD treatment needs of patients (Duncan et al., 2020).

Patients with concurrent SUD and infectious diseases have multiple barriers to care engagement aggravated by complex medical, behavioral, and social problems. Importantly, we found significant reductions in emergent healthcare utilization including ED visits and inpatient hospitalizations at 6-month follow-up for patients engaged in RESTORE. In addition to supporting clinicians in evaluating and treating SUD, our implementation strategy integrating peers with lived SUD experience as members of a multidisciplinary health care team for recovery support services and healthcare system navigation may be particularly effective in supporting patients with complex psychosocial problems that complicate SUD care and prognosis. Peers provide support via SUD treatment education, healthcare system navigation, and emotional support and mentoring (Dutcher et al., 2011). They tap into their own experiences, positioning themselves as positive and credible role

models (Dutcher et al., 2011) who effectively provide instrumental, informational, and emotional support and translate health information in culturally congruent ways. The role of peers is further validated by the majority of participants who reported the most helpful components of RESTORE as "just knowing that someone cares" and routine phone calls from peers. Peer-facilitated interventions have been found to be effective in improving outcomes for a variety of conditions and are associated with increased rates of viral suppression for patients with HIV (Bradford et al., 2007; Cunningham et al., 2018; Dohan & Schrag, 2005). As such, peers have been incorporated into many health teams (Gagne et al., 2018).

Evidence-based treatment for SUD such as buprenorphine have been associated with improved outcomes, including increased engagement in HIV and HCV care (Lucas et al., 2010; Norton et al., 2017). However, the majority of patients with SUD who may benefit from these medications never initiate or are not retained on them. With implementation of the RESTORE model, over 70% of patients with OUD had initiated buprenorphine through RESTORE at baseline with 50% still receiving buprenorphine in the program at 6 months with an additional 20% linked to SUD treatment in other community-based settings thus expanding treatment reach and matching outcomes of existing OBOT programs (Soeffing et al., 2009). Evidence-based strategies are needed to improve rates of retention in the full range of SUD treatments implemented in office-based and infectious disease care settings. Further evaluation of the RESTORE implementation strategy in prospective randomized controlled trials and evaluation of cost-effectiveness are needed especially given potential impact across multiple outcomes including substance use, mental health, emergency department and hospital utilization, HIV viral suppression and HCV cure.

Limitations

Our study is limited by the evaluation of a limited number of implementation outcomes (adoption, appropriateness and reach). Fidelity to implementation strategy including attempted weekly contact by peers to patients was informally assessed during weekly team meetings but systematic tracking of if peers were able to connect with patients was not done. We also did not utilize a systematic implementation intervention development framework in the development of implementation strategies. Additionally, the implementation strategy was implemented in one urban ID clinic with a patient population that is predominately Black and receiving treatment for HIV. Evaluation in other ID care settings is needed to understand broader generalizability. The patient population studied is, however, similar to populations seeking care in many urban settings throughout the U.S. Additionally, HIV and HCV laboratory measures were collected as a component of routine clinical care, with much of data collection spanning the COVID-19 pandemic when routine laboratory testing was suspended. As such, these data were available on only a subset of participants. Finally, this is a single group observational study. Absence of a control group limits a full understanding of the causal effect of the RESTORE intervention on patient and clinical outcomes.

Conclusion

Our study demonstrates the promise of improved SUD and ID outcomes through integrated SUD and ID outpatient care. This team approach with a clinician champion and peers supported by an addiction psychiatrist and therapist has potential for replication in other ID care settings. This strategy is being evaluated in a prospective randomized control trial.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Ethics approval

The Johns Hopkins University School of Medicine Institutional Review Board (approval # IRB00191521).

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SAMHSA and NIH had no role in the study design, data collection, data analysis, data interpretation, writing of the report, or decision to submit for publication.

Ethics

The Johns Hopkins University School of Medicine Institutional Review Board approved the study protocol and each participant provided informed consent.

Declaration of interests

OFN reports research funds paid to her institution by AbbVie Inc. and consulting fees from Gilead. MS reports research funds paid to his institution by Janssen, Vir, GSK (HBV) and consulting fees from AbbVie, Antios, Assembly Bio, Atea, GSK, Gilead, Precision Bio, and Vir. All other authors declare no competing interests.

REFERENCES

Altice FL, Bruce RD, Lucas GM, Lum PJ, Korthuis PT, Flanigan TP, Cunningham CO, Sullivan LE, Vergara-Rodriguez P, Fiellin DA, Cajina A, Botsko M, Nandi V, Gourevitch MN, Finkelstein R, & Collaborative B (2011). HIV treatment outcomes among HIV-infected, opioid-dependent patients receiving buprenorphine/naloxone treatment within HIV clinical care settings: results from a multisite study. J Acquir Immune Defic Syndr, 56 Suppl 1, S22–32. 10.1097/QAI.0b013e318209751e [PubMed: 21317590]

ASAM. (2023). Fundamentals of Addiction Medicine. Retrieved February 1 from https://elearning.asam.org/fundamentals-echo-series

Azar P, Wood E, Nguyen P, Luma M, Montaner J, Kerr T, & Milloy MJ (2015). Drug use patterns associated with risk of non-adherence to antiretroviral therapy among HIV-positive illicit drug users in a Canadian setting: a longitudinal analysis. BMC Infect Dis, 15, 193. 10.1186/s12879-015-0913-0 [PubMed: 25927573]

Babor TF, de la Fuente JR, Saunders J, & Grant M (1989). The Alcohol Use Disorders Identification Test: guidelines for use in primary care. World Health Organization.

Bradford JB, Coleman S, & Cunningham W (2007). HIV System Navigation: an emerging model to improve HIV care access. AIDS Patient Care STDS, 21 Suppl 1, S49–58. 10.1089/apc.2007.9987 [PubMed: 17563290]

Brooklyn JR, & Sigmon SC (2017). Vermont Hub-and-Spoke Model of Care for Opioid Use Disorder: Development, Implementation, and Impact. J Addict Med, 11(4), 286–292. 10.1097/ADM.0000000000000310 [PubMed: 28379862]

Centers for Disease Control and Prevention. (2022). Viral hepatitis surveillance report, 2020. U.S. Department of Health and Human Services. Retrieved January 30, 2023 from https://www.cdc.gov/hepatitis/statistics/2020surveillance/index.htm

Chamberlain P, Brown CH, & Saldana L (2011). Observational measure of implementation progress in community based settings: the Stages of Implementation Completion (SIC). Implement Sci, 6, 116. 10.1186/1748-5908-6-116 [PubMed: 21974914]

Coyle JR, Freeland M, Eckel ST, & Hart AL (2020). Trends in morbidity, mortality, and cost of hospitalizations associated with infectious disease sequelae of the opioid epidemic. J Infect Dis, 222(Suppl 5), S451–s457. 10.1093/infdis/jiaa012 [PubMed: 32877550]

Cunningham CO, Kunins HV, Roose RJ, Elam RT, & Sohler NL (2007). Barriers to obtaining waivers to prescribe buprenorphine for opioid addiction treatment among HIV physicians. J Gen Intern Med, 22(9), 1325–1329. 10.1007/s11606-007-0264-7 [PubMed: 17619934]

Cunningham WE, Weiss RE, Nakazono T, Malek MA, Shoptaw SJ, Ettner SL, & Harawa NT (2018). Effectiveness of a Peer Navigation Intervention to Sustain Viral Suppression Among HIV-Positive Men and Transgender Women Released From Jail: The LINK LA Randomized Clinical Trial. JAMA Intern Med, 178(4), 542–553. 10.1001/jamainternmed.2018.0150 [PubMed: 29532059]

Degenhardt L, Webb P, Colledge-Frisby S, Ireland J, Wheeler A, Ottaviano S, Willing A, Kairouz A, Cunningham EB, Hajarizadeh B, Leung J, Tran LT, Price O, Peacock A, Vickerman P, Farrell M, Dore GJ, Hickman M, & Grebely J (2023). Epidemiology of injecting drug use, prevalence of injecting-related harm, and exposure to behavioural and environmental risks among people who inject drugs: a systematic review. The Lancet Global Health, 11(5), e659–e672. 10.1016/s2214-109x(23)00057-8 [PubMed: 36996857]

Dohan D, & Schrag D (2005). Using navigators to improve care of underserved patients: current practices and approaches. Cancer, 104(4), 848–855. 10.1002/cncr.21214 [PubMed: 16010658]

Duncan A, Anderman J, Deseran T, Reynolds I, & Stein BD (2020). Monthly Patient Volumes of Buprenorphine-Waivered Clinicians in the US. JAMA Netw Open, 3(8), e2014045. 10.1001/jamanetworkopen.2020.14045 [PubMed: 32833015]

Dutcher MV, Phicil SN, Goldenkranz SB, Rajabiun S, Franks J, Loscher BS, & Mabachi NM (2011). "Positive Examples": a bottom-up approach to identifying best practices in HIV care and treatment based on the experiences of peer educators. AIDS Patient Care STDS, 25(7), 403–411. 10.1089/apc.2010.0388 [PubMed: 21671756]

Edelman EJ, Dziura J, Esserman D, Porter E, Becker WC, Chan PA, Cornman DH, Rebick G, Yager J, Morford K, Muvvala SB, & Fiellin DA (2020). Working with HIV clinics to adopt addiction treatment using implementation facilitation (WHAT-IF?): Rationale and design for a hybrid type 3 effectiveness-implementation study. Contemp Clin Trials, 98, 106156. 10.1016/j.cct.2020.106156 [PubMed: 32976995]

Edelman EJ, Gan G, Dziura J, Esserman D, Porter E, Becker WC, Chan PA, Cornman DH, Helfrich CD, Reynolds J, Yager JE, Morford KL, Muvvala SB, & Fiellin DA (2022). Effect of Implementation Facilitation to Promote Adoption of Medications for Addiction Treatment in US HIV Clinics: A Randomized Clinical Trial. JAMA Netw Open, 5(10), e2236904. 10.1001/jamanetworkopen.2022.36904 [PubMed: 36251291]

Gagne CA, Finch WL, Myrick KJ, & Davis LM (2018). Peer workers in the behavioral and integrated health workforce: opportunities and future directions. Am J Prev Med, 54(6 Suppl 3), S258–s266. 10.1016/j.amepre.2018.03.010 [PubMed: 29779550]

Jakubowski A, & Fox A (2020). Defining Low-threshold Buprenorphine Treatment. J Addict Med, 14(2), 95–98. 10.1097/ADM.0000000000000555 [PubMed: 31567596]

Kangethe A, Polson M, Lord TC, Evangelatos T, & Oglesby A (2019). Real-world health plan data analysis: key trends in medication adherence and overall costs in patients with HIV. J Manag Care Spec Pharm, 25(1), 88–93. 10.18553/jmcp.2019.25.1.088 [PubMed: 30589631]

Kim J, Lesko CR, Fojo AT, Keruly JC, Moore RD, Chander G, & Lau B (2021). The effect of buprenorphine on human immunodeficiency virus viral suppression. Clin Infect Dis, 73(11), 1951–1956. 10.1093/cid/ciab578 [PubMed: 34171087]

Korthuis PT, Lum PJ, Vergara-Rodriguez P, Ahamad K, Wood E, Kunkel LE, Oden NL, Lindblad R, Sorensen JL, Arenas V, Ha D, Mandler RN, McCarty D, & Investigators C-C (2017). Feasibility and safety of extended-release naltrexone treatment of opioid and alcohol use disorder in HIV clinics: a pilot/feasibility randomized trial. Addiction, 112(6), 1036–1044. 10.1111/add.13753 [PubMed: 28061017]

Kroenke K, Spitzer RL, & Williams JB (2003). The Patient Health Questionnaire-2: validity of a two-item depression screener. Med Care, 41(11), 1284–1292. 10.1097/01.MLR.0000093487.78664.3C [PubMed: 14583691]

Lesko CR, Hutton HE, Edwards JK, McCaul ME, Fojo AT, Keruly JC, Moore RD, & Chander G (2021). Alcohol use disorder and recent alcohol use and HIV viral non-suppression among people engaged in HIV care in an urban clinic, 2014–2018 [OriginalPaper]. AIDS Behav, 26(4), 1299–1307. 10.1007/s10461-021-03487-3 [PubMed: 34626264]

Low AJ, Mburu G, Welton NJ, May MT, Davies CF, French C, Turner KM, Looker KJ, Christensen H, McLean S, Rhodes T, Platt L, Hickman M, Guise A, & Vickerman P (2016). Impact of Opioid Substitution Therapy on Antiretroviral Therapy Outcomes: A Systematic Review and Meta-Analysis. Clin Infect Dis, 63(8), 1094–1104. 10.1093/cid/ciw416 [PubMed: 27343545]

Lucas GM, Chaudhry A, Hsu J, Woodson T, Lau B, Olsen Y, Keruly JC, Fiellin DA, Finkelstein R, Barditch-Crovo P, Cook K, & Moore RD (2010). Clinic-based treatment of opioid-dependent HIV-infected patients versus referral to an opioid treatment program: A randomized trial. Ann Intern Med, 152(11), 704–711. 10.7326/0003-4819-152-11-201006010-00003 [PubMed: 20513828]

MacArthur GJ, Minozzi S, Martin N, Vickerman P, Deren S, Bruneau J, Degenhardt L, & Hickman M (2012). Opiate substitution treatment and HIV transmission in people who inject drugs: Systematic review and meta-analysis. BMJ (Clinical research ed.), 345, e5945. 10.1136/bmj.e5945

Mattick RP, Breen C, Kimber J, & Davoli M (2014). Buprenorphine maintenance versus placebo or methadone maintenance for opioid dependence. Cochrane Database Syst Rev(2), CD002207. 10.1002/14651858.CD002207.pub4 [PubMed: 24500948]

Norton BL, Beitin A, Glenn M, DeLuca J, Litwin AH, & Cunningham CO (2017). Retention in buprenorphine treatment is associated with improved HCV care outcomes. J Subst Abuse Treat, 75, 38–42. 10.1016/j.jsat.2017.01.015 [PubMed: 28237052]

Parcesepe AM, Lancaster K, Edelman EJ, DeBoni R, Ross J, Atwoli L, Tlali M, Althoff K, Tine J, Duda SN, Wester CW, Nash D, & Consortium I (2020). Substance use service availability in HIV treatment programs: Data from the global IeDEA consortium, 2014–2015 and 2017. PLoS One, 15(8).

Pinto RM, Chen Y, & Park SE (2019). A client-centered relational framework on barriers to the integration of HIV and substance use services: a systematic review. Harm Reduct J, 16(1), 1–12. 10.1186/s12954-019-0347-x [PubMed: 30611251]

Platt L, Minozzi S, Reed J, Vickerman P, Hagan H, French C, Jordan A, Degenhardt L, Hope V, Hutchinson S, Maher L, Palmateer N, Taylor A, Bruneau J, & Hickman M (2017). Needle syringe programmes and opioid substitution therapy for preventing hepatitis C transmission in people who inject drugs. The Cochrane Database of Systematic Reviews, 9(9), Cd012021. 10.1002/14651858.CD012021.pub2 [PubMed: 28922449]

Powell BJ, Waltz TJ, Chinman MJ, Damschroder LJ, Smith JL, Matthieu MM, Proctor EK, & Kirchner JE (2015). A refined compilation of implementation strategies: results from the Expert Recommendations for Implementing Change (ERIC) project. Implement Sci, 10, 21. 10.1186/s13012-015-0209-1 [PubMed: 25889199]

Proctor EK, Powell BJ, & McMillen JC (2013). Implementation strategies: recommendations for specifying and reporting. Implement Sci, 8, 139. 10.1186/1748-5908-8-139 [PubMed: 24289295]

Rosenthal ES, Silk R, Mathur P, Gross C, Eyasu R, Nussdorf L, Hill K, Brokus C, D'Amore A, Sidique N, Bijole P, Jones M, Kier R, McCullough D, Sternberg D, Stafford K, Sun J, Masur H,

Kottilil S, & Kattakuzhy S (2020). Concurrent Initiation of Hepatitis C and Opioid Use Disorder Treatment in People Who Inject Drugs. Clin Infect Dis. 10.1093/cid/ciaa105

SAMHSA. (2023). Removal of DATA Waiver (X-Waiver) Requirement. Retrieved January 3 from https://www.samhsa.gov/medications-substance-use-disorders/removal-data-waiver-requirement

Santo T, Clark B, Hickman M, Grebely J, Campbell G, Sordo L, Chen A, Tran LT, B. C, P. P, C. G, D. J, K. E, M. R, N. B, M. J, P. R, F. M, & D. L (2021). Association of opioid agonist treatment with all-cause mortality and specific causes of death among people with opioid dependence: A systematic review and meta-analysis. JAMA Psychiatry, 78(9), 979–993. 10.1001/jamapsychiatry.2021.0976 [PubMed: 34076676]

Schwetz TA, Calder T, Rosenthal E, Kattakuzhy S, & Fauci AS (2019). Opioids and infectious diseases: a converging public health crisis. J Infect Dis, 220(3), 346–349. 10.1093/infdis/jiz133 [PubMed: 30941402]

Soeffing JM, Martin LD, Fingerhood MI, Jasinski DR, & Rastegar DA (2009). Buprenorphine maintenance treatment in a primary care setting: outcomes at 1 year. J Subst Abuse Treat, 37(4), 426–430. 10.1016/j.jsat.2009.05.003 [PubMed: 19553061]

Sordo L, Barrio G, Bravo MJ, Indave BI, Degenhardt L, Wiessing L, Ferri M, & Pastor-Barriuso R (2017). Mortality risk during and after opioid substitution treatment: systematic review and meta-analysis of cohort studies. BMJ, 357, j1550. 10.1136/bmj.j1550 [PubMed: 28446428]

Spitzer RL, Kroenke K, Williams JB, & Löwe B (2006). A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch Intern Med, 166(10), 1092–1097. 10.1001/archinte.166.10.1092 [PubMed: 16717171]

Springer SA, Merluzzi AP, & Del Rio C (2020). Integrating Responses to the Opioid Use Disorder and Infectious Disease Epidemics: A Report From the National Academies of Sciences, Engineering, and Medicine. JAMA, 324(1), 37–38. 10.1001/jama.2020.2559 [PubMed: 32159771]

StataCorp. (2021). Stata Statistical Software: Release 17. In: StataCorp LLC.

Waltz TJ, Powell BJ, Matthieu MM, Damschroder LJ, Chinman MJ, Smith JL, Proctor EK, & Kirchner JE (2015). Use of concept mapping to characterize relationships among implementation strategies and assess their feasibility and importance: results from the Expert Recommendations for Implementing Change (ERIC) study. Implement Sci, 10, 109. 10.1186/s13012-015-0295-0 [PubMed: 26249843]

Zibbell JE, Asher AK, Patel RC, Kupronis B, Iqbal K, Ward JW, & Holtzman D (2018). Increases in acute hepatitis C virus infection related to a growing opioid epidemic and associated injection drug use, United States, 2004 to 2014. Am J Public Health, 108(2), 175–181. 10.2105/ajph.2017.304132 [PubMed: 29267061]

Table 1:

Specification of RESTORE multicomponent implementation strategies

Strategy name	Strategy	Definition	Actor	Action	Action target/ Mechanism	Dose
On-site buprenorphine waiver training	Training	Training in SUD screening, counselling and treatment	Implementation team	An onsite in-person 8-hour buprenorphine waiver training Additional online resources/training available through PCSS shared with clinicians by email	Frontline clinicians providing care *Mechanism* Intended to address the barrier of limited comfort with SUD care through SUD care education	Once
Online SUD training module resource						Quarterly
SUD care didactics and case discussions	Ongoing consultation	SUD focused care discussions at weekly clinical meeting	Implementation team			Quarterly
Clinician champion	Local technical assistance	Provides direct SUD care and builds clinic capacity for SUD care	Front line Service clinician	An ID clinician with interest in SUD care received salary support for dedicated SUD training, SUD care and provision of support to other ID clinicians for SUD care	Patients with SUD and ID clinicians *Mechanism* Intended to address the barrier of limited comfort with SUD care through SUD care support	Continuous
Peer recovery specialist (PRS)	Patient engagement	An individual with lived experience of substance use was hired as a member of the health care team and trained to provide peer support and SUD care coordination	Peer recovery specialist (PRS)	Facilitates SUD/ID care, communicates with clinical team	Patients with SUD	**As needed**
				Engages with patient to identify personal goals and support linkage to and engagement with SUD/ID care	Patients with SUD *Mechanism* Intended to address the barrier of limited support for SUD care through peer counselling and SUD care engagement support	Weekly
				Leads weekly recovery support group meetings	Patients with SUD	Weekly
Weekly team meeting	Monitoring	T racking patient progress	PRS, Addiction Psychiatrist, Clinician Champion	Discuss individual cases, define and monitor progress of treatment plans	Patients with SUD *Mechanism* Group assessment of fidelity to care plans	Weekly

Clinicians Clinical Support System (PCSS) is a US national SUD training and clinical mentoring project

TABLE 2.

Participant characteristics at baseline for total sample (N=137)

	Total sample
Demographics	
Gender, n (%)	
Male	86 (62.8)
Female	50 (36.5)
Non-binary	1 (0.7)
Age, m (SD)	52.1 (10.4)
Race, n (%) *	
Black/African American	114 (83.8)
White	17 (12.5)
Other	5 (3.7)
Hispanic, n (%) *	2 (1.5)
Education, high school diploma or higher, n (%)	73 (53.3)
Homeless past 30 days (streets, shelter), n (%)	15 (11.0)
Married/partner, n (%) *	39 (28.7)
Employed (full-time or part-time), n (%)	15 (11.0)
Infectious disease treatment, current	
HIV, n (%)	102 (74.4)
HCV/HBV only, n (%)	33 (24.1)
Other infectious disease only, n (%)	2 (1.5)
Substance use history	
Injected drugs past 30 days, n (%)	18 (13.1)
Days of illicit substance use past 30 days, m (SD)	10.5 (10.9)
Used any illicit or non-prescribed opioids past 30 days, n (%)	70 (51.1)
Used heroin past 30 days, n (%)	63 (46.0)
Days of heroin use past 30 days, m (SD)	6.1 (9.8)
Used fentanyl (non-prescribed) past 30 days, n (%) *	42 (30.9)
Days of fentanyl use (non-prescribed) past 30 days, m (SD) *	3.9 (8.3)
Used cocaine/crack past 30 days, n (%)	65 (47.5)
Days of cocaine/crack use past 30 days, m (SD)	4.5 (7.8)
Used marijuana past 30 days, n (%)	49 (35.8)
Days of marijuana use past 30 days, m (SD)	4.1 (8.8)
Ever overdosed, n (%)	64 (46.7)
Overdosed in past 90 days, n (%)	17 (12.4)
Hazardous alcohol use past 12 months (score 8–40 on AUDIT), n (%)	41 (29.9)
Substance use diagnosis	
Opioid Use Disorder, n (%)	104 (75.9)
Cocaine Use Disorder, n (%)	70 (51.1)
Alcohol Use Disorder, n (%)	50 (36.5)

	Total sample
Hospital visits	
ED visit for any reason (physical health, mental health, SUD) in past 30 days, self-report, n (%)	32 (23.4)
Hospitalized for any reason (physical health, mental health, SuD) in past 30 days, self-report, n (%) **	20 (14.8)
Mental health screening	
General Anxiety Disorder (scored 10–21 on GAD-7), n (%) *	28 (20.6)
Major Depressive Disorder (scored 3–6 on PHQ-2), n (%) *	34 (25.0)

Percentages may not add to 100% due to rounding. HIV= human immunodeficiency virus. HCV=hepatitis C virus. HBV=hepatitis B virus. AUDIT= Alcohol Use Disorders Identification Test. ED=emergency department. SUD=substance use disorder. GAD=Generalized Anxiety Disorder. PHQ=Patient Health Questionnaire.

* *N*=136, 1 case missing.

** *N*=135, 2 cases missing.

TABLE 3:

Substance use, health care utilization, and mental health outcomes for paired baseline and 6-month data (N=127)

	Baseline	6 month	p value
Substance use			
Injected drugs past 30 days, n (%)	16 (12.6)	10 (7.9)	0.07
Days of illicit substance use past 30 days, m (SD)	10.5 (10.9)	8.9 (12.0)	0.21
Used any illicit or non-prescribed opioids past 30 days, n (%)	66 (52.0)	41 (32.3)	**<0.001**
Used heroin past 30 days, n (%)	60 (47.2)	34 (26.8)	**<0.001**
Days of heroin use past 30 days, m (SD)	6.1 (9.7)	3.9 (9.0)	**0.02**
Used fentanyl (non-prescribed) past 30 days, n (%) *	39 (31.0)	24 (19.1)	**0.009**
Days of fentanyl use (non-prescribed) past 30 days, m (SD) *	3.9 (8.2)	2.5 (7.4)	0.07
Used cocaine past 30 days, n (%)	59 (46.5)	43 (33.9)	**0.006**
Days of cocaine/crack use past 30 days, m (SD)	4.5 (7.8)	3.6 (7.6)	0.26
Used marijuana past 30 days, n (%)	44 (34.7)	37 (29.1)	0.21
Days of marijuana use past 30 days, m (SD)	4.1 (8.8)	4.0 (9.2)	0.97
Overdose in past 90 days, n (%) *	17 (13.5)	3 (2.4)	**0.002**
Days of alcohol use past 30 days, m (SD) *	5.6 (9.2)	3.5 (7.3)	**0.002**
Hazardous alcohol use (score 8–40 on AUDIT), n (%)	37 (29.1)	21 (16.5)	**<0.001**
Mental health screening			
General Anxiety Disorder (scored 10–21 on GAD-7), n (%) **	27 (21.6)	12 (9.6)	**0.004**
Major Depressive Disorder (scored 3–6 on PHQ-2), n (%) **	31 (24.8)	27 (21.6)	0.48
Hospital visits			
ED visit for any reason (physical health, mental health, SUD) in past 30 days, self-report, n (%) *	29 (23.0)	11 (8.7)	**0.002**
Hospitalized for any reason (physical health, mental health, SuD) in past 30 days, self-report, n (%) ***	18 (14.5)	8 (6.5)	**0.03**

AUDIT=Alcohol Use Disorders Identification Test. ED=emergency department. SUD=substance use disorder. GAD=Generalized Anxiety Disorder. PHQ=Patient Health Questionnaire.

* N=126, 1 case missing.

** N=125, 2 cases missing.

*** N=124, 3 cases missing.

TABLE 4:

HIV and HCV RNA results for paired data at baseline and 6 months

	Baseline	6-month	p value
HIV RNA[*], *n* (%)			
<20 copies/ml	37 (55.2)	46 (68.7)	**0.04**
≥20 copies/ml	30 (44.8)	21 (31.3)	
HCV RNA[□], *n* (%)			**<0.001**
No active HCV	10 (32.3)	25 (80.7)	
Active HCV	21 (67.7)	6 (19.4)	

Total baseline sample: N=137. HIV= human immunodeficiency virus. HCV=hepatitis C virus. RNA= ribonucleic acid.

[*]N=102 participants who indicated receiving treatment for HIV at Bartlett at baseline. Paired lab test results available for n=67 participants (within the 3-month period preceding their baseline interview and the 3-month period preceding or following their 6-month interview due date).

[□]N=47 participants who indicated receiving treatment for HCV at Bartlett at baseline. Paired lab test results available for n=31 participants for baseline and 6 months