Emergency Department Use among HIV-Infected Released Jail Detainees

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ABSTRACT Release from short-term jail detention is highly destabilizing, associated with relapse to substance use, recidivism, and disrupted health care continuity. Little is known about emergency department (ED) use, potentially a surrogate for medical, psychiatric, or social instability, by people living with HIV/AIDS (PLWHA) leaving jails. All ED visits were reviewed from medical records for a cohort of 109 PLWHA in the year following release from county jail in Connecticut, between January 1, 2008 and December 31, 2010. Primary outcomes were frequency and timing of ED visits, modeled using multivariate negative binomial regression and Cox proportional hazards regression, respectively. Demographic, substance use, and psychiatric disorder severity factors were evaluated as potential covariates. Overall, 71 (65.1 %) of the 109 participants made 300 unique ED visits (2.75 visits/person-year) in the year following jail-release. Frequency of ED use was positively associated with female sex (incidence rate ratios, IRR 2.40 [1.36–4.35]), homelessness (IRR 2.22 [1.15–4.41]), and recent substance use (IRR 2.47 [1.33–4.64]), and inversely associated with lifetime drug severity (IRR 0.01 [0–0.10]), and being retained in HIV primary care (IRR 0.80 [0.65–0.99]). Those in late or sustained HIV care used the ED sooner than those not retained in HIV primary care (median for late retention 16.3 days, median for sustained retention 24.9 days, median for no retention not reached at 12 months, p value 0.004). Using multivariate modeling, those who used the ED earliest upon release were more likely to be homeless (HR 1.98 [1.02–3.84]), to be retained in HIV care (HR 1.30 [1.04–1.61]), and to have recently used drugs (HR 2.51 [1.30–4.87]), yet had a low lifetime drug severity (HR 0.01 [0.00–0.14]). Among PLWHA released from jail, frequency of ED use is high, often soon after release, and is associated with social and drug-related destabilizing factors. Future interventions for this specific population should focus on addressing these resource gaps, ensuring housing, and establishing immediate linkage to HIV primary care after release from jail.

KEYWORDS HIV/AIDS, Prisoners, Jail health, Vulnerable populations, Emergency department, Mental health, Substance use disorders, Buprenorphine, Homelessness

INTRODUCTION

Among the over 1.1 million people living with HIV/AIDS (PLWHA) in the USA, one sixth cycle through the criminal justice system (CJS) annually, primarily through jails,¹ making these settings important sites for diagnosing and treating

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HIV.^{2,3} Specifically, within the CJS, including prisons and jails, it is estimated that HIV prevalence is threefold higher than in the community.⁴ Evidence supports increased HIV testing,^{5,6} provision of antiretroviral therapy (ART),⁷ and continuity of care for those involved in the CJS.⁸ Provision of ART during incarceration results in high rates of HIV viral suppression,^{1,9-13} but these benefits seldom persist post-release.¹⁰ This finding dovetails with evidence that, among PLWHA who are released from the CJS, the immediate post-release period is associated with disruptions in continuity of HIV care,¹⁴ high rates of relapse to drug and alcohol use,¹⁵⁻¹⁷ homelessness,¹⁸⁻²⁰ re-incarceration,^{21,22} violence victimization,²³⁻²⁵ and mortality.¹⁶

Concurrently, among PLWHA not within the CJS, frequent and repetitive emergency department (ED) use, as opposed to continuous primary care, has been associated with HIV disease-related symptoms²⁶ and substance use disorders (SUDs)²⁷⁻²⁹ in the pre- and early ART era. Alternatively, PLWHA may seek care in the ED at a higher rate than the general population as a means to address unmet medical or social needs, such as SUDs or homelessness.^{28,30,31} These unmet needs, however, are potentially more acute during the destabilizing transition from jails to communities, rather than from prisons where pre-release planning can be coordinated, because patients are often released from jail without opportunity to develop and implement a plan for continuity of care.³²

ED use among PLWHA released from prisons, sites where planning is feasible because of a defined period of detention, including those who use the ED most frequently, are associated with marginal housing, social instability,³³ and poorer perceived health,³⁴ but there exist no such data among PLWHA transitioning from jails, where stays are short and release dates are unpredictable. As opposed to prisoners, jail detainees are more likely to be un-sentenced and lack linkages to continued HIV primary care and ART⁹ and to service programs that address housing³⁵ and SUDs.³⁶ A lack of transition programming is related to high population turnover in jail, further compounding social and health instability. Median length-of-stay in jails ranges from hours to 38 days,⁵ with one quarter of jail detainees released within 2 weeks.³⁷

The objective of this study was to describe ED utilization among PLWHA transitioning from jail to the community, specifically in the quantity, timing, and correlates of ED use in the 12 months following jail-release, hypothesizing that ED visits are a proxy for the social and medical instability experienced by jailed PLWHA returning to the community. Potential correlates of ED use were chosen and categorized based on the Behavioral Health Model adapted for vulnerable populations.³⁸ This model proposes that health care utilization, including ED use, is driven by the interplay among three domains: predisposing factors that comprise an individual's demographics and social structure, need factors that involve objective and perceived markers of health and disease, including disease severity, and enabling resources that include an array of personal and community resources, including access to public benefits and services. This model of health care utilization (see Fig. 1) has been applied to homeless populations,³⁸ and more recently to PLWHA released from jails³⁵ and prisons.³³

Description of the ED use among a population of HIV-infected released jail detainees identifies specific health care needs in a time of social and health instability, with public policy implications.

FIG. 1 Behavioral Health Model for Vulnerable Populations (Adapted from Gelberg et al.³⁸).

METHODS

This is a retrospective analysis of 12-month ED use among a prospectively enrolled cohort of HIV-infected jail detainees transitioning to New Haven or Waterbury, Connecticut, and enrolled in the Connecticut site of the Enhancing Linkages to HIV Primary Care and Services in Jail Setting Initiative (EnhanceLink).

Setting and Selection of Participants

The 10-site EnhanceLink project, a HRSA-funded Special Project of National Significance, was designed to implement and evaluate strategies for improving post-release health of jailed PLWHA⁵ and represents the largest cohort of HIV-infected released jail detainees transitioning to the community. This cohort has been described across many domains, including HIV treatment outcomes,³⁹ new HIV infections,³ longitudinal retention in care,¹⁴ gender differences in service needs⁴⁰ and HIV treatment outcomes,⁴¹ pre- and post-release homelessness,^{20,35} recidivism,²² and SUDs.^{17,36} Health care utilization among this cohort has not previously been described. The current analysis is limited to the Connecticut site of EnhanceLink because it was the only one to systematically collect longitudinal data on ED utilization following jail-release.

Eligibility for participation in the parent study was restricted to jail detainees, aged 18 or older, with confirmed HIV infection and plans to return post-release to either New Haven or Waterbury, Connecticut, between 2008 and 2011. In Connecticut, where jails house pre-sentence detainees and those sentenced to shorter terms, there are 11 prisons and 4 jails for men, and a single facility, serving as both a jail and a prison, for women. Participants were followed for 12 months following release from jail, during which they received intensive case management and buprenorphine for those who met criteria for opioid dependence, along with quarterly assessments and structured interviews. Since ED use over the course of 1 year was the primary outcome in the analysis, we excluded 20 participants who were not yet released at the time the parent study closed. We included those people

who may have been re-detained at another point during the year following their index detention. A total of 109 participants completed baseline interviews within 7 days of release from jail and were actually released, comprising our final analytic sample (Fig. 2).

Study Protocol

Upon entry into the parent study, all participants signed written informed consent along with a release of medical information allowing access to all health care records for the proposed study period, inclusive of the year prior to jail entry and for 5 years after release. The medical release included all health care facilities in New Haven and Waterbury, the two largest cities with EDs. A standardized health care utilization data collection instrument, employed in a previous study of incarcerated PLWHA transitioning to the community, was used to extract all ED and hospitalization data.³³ The study instrument included dates and times of visits, chief complaint, physician diagnosis, results of urine toxicology tests, and subject disposition. Comprehensive review of medical records for each subject for the 1 year prior to detention and the 1 year after release was conducted at all four hospitals in New Haven and Waterbury; no participants identified the Veterans’ Administration Hospital as their primary source of care. Both ED visits and hospitalization data were reviewed and included. Medical records were reviewed for all participants enrolled in the study who completed a baseline interview and were released from jail, regardless of overall attrition in the parent study, with the exception of pre-detention and post-release data for those subjects still detained at the close of the parent study. All chart reviews were performed by one author (ATB); after which, a random sample of 10 % of all visit dates was reviewed by a second author (JPM). Discrepancies in dates and numbers of ED visits were resolved by a third author (DLS). All study protocols were approved by the Yale University Institutional Review Board and the Connecticut Department of Correction Research Advisory Committee. The parent EnhanceLink study is registered at www.clinicaltrials.gov

FIG. 2 Disposition of research participants.

(NCT #00841711), and a Certificate of Confidentiality from the National Institutes of Health conferred additional protections.

Methods of Measurement

Data from baseline and 6-month interviews were used along with a standardized medical record review of ED use.

ED Use. The primary outcome was frequency and timing of ED use in the 12 months following release from jail, using dates extracted from medical record review. Reasons for ED visit were recorded both as chief complaint stated by the patient/participant and as diagnoses listed by the medical provider. Reasons were categorized into clinically meaningful groups, including pain, trauma, mental illness, and substance use, similar to previously published categories.^{33,34} “Early ED users” were defined as those with an ED visit within the first 6 months post-release, as compared to “late ED users,” with an ED visit 6–12 months post-release. It should be noted that the number of visitors to the ED at earlier points in time post-release, including 2 weeks, 1 month, and 3 months post-release, were assessed, but only the initial 6-month interval had sufficient ED use frequencies to allow for statistically meaningful comparisons.

For the purposes of this study, predisposing factors included the following variables:

Demographics. Baseline demographics of each subject were recorded as part of the validated⁴² Addiction Severity Index (ASI), including age, sex, level of education, marital status, and self-reported race/ethnicity.⁴³ Housing status was defined using previously described categories,^{20,35} based on each subject’s anticipated housing situation upon release and categorized as homeless, temporarily housed, or permanently housed. History of interpersonal abuse (see: <http://www.who.int/violenceprevention/approach/definition/en/> for definition) inclusive of intimate partner violence was measured by the ASI using self-report of any emotional, physical, or sexual abuse in one’s lifetime, and it was coded as a dichotomous variable indicating any history of abuse or no history of abuse. Reentry site, New Haven or Waterbury, was coded dichotomously.

Presence of Substance Use Disorders. Alcohol use disorders were measured using the validated Alcohol Use Disorders Identification Test (AUDIT) with hazardous drinking defined as a score of ≥ 8 for men and ≥ 4 for women, harmful drinking as a score of ≥ 16 for both sexes, and alcohol dependence as a score of ≥ 20 for both sexes.^{44,45} Opioid dependence was assessed using standard *DSM-IV* criteria and coded dichotomously.

As a complementary measure of presence of substance use disorders, the ASI was used for presence of severe alcohol or drug use disorders, with measures with high validity as meeting criteria for dependence for alcohol (score >0.17) or for drugs (score >0.16) dichotomously scored.^{46,47}

Presence of Psychiatric Disorders. Lifetime psychiatric symptoms were assessed using the ASI Psychiatric Status subscale, and presence of a severe psychiatric disorder was recorded dichotomously, with presence of a severe disorder defined as a score >0.22 .⁴⁷

Need factors included the following variables:

Markers of HIV Biological Severity. Absolute CD4 count (cells/ μ L) and quantitative HIV-1 RNA levels (copies/mL) were measured at baseline, within the first 3 months post-release, and at the 6-month post-release visit. CD4 count was examined as both continuous and dichotomous (<200 versus ≥ 200) variables; viral load (VL) was examined as a dichotomous variable with VL <400 copies/mL indicating viral suppression versus ≥ 400 copies/mL.

Acuity and Severity of Substance Use Disorders. Baseline or recent substance use non-inclusive of alcohol within the last 30 days was assessed using the ASI. Lifetime drug and alcohol use was measured using the ASI, and severity was assessed using continuous alcohol and drug composite sub-scores, ranging from 0 to 1, with higher values reflecting increasing severity.⁴³

Psychiatric Disorder Severity. Lifetime psychiatric symptoms were assessed using the ASI Psychiatric Status subscale, and severity was assessed using the continuous psychiatric sub-score, ranging from 0 to 1, with larger values reflecting greater severity⁴³. The use of the ASI Psychiatric Status scale has been found to predict the use of mental health care⁴⁸. Depressive symptoms were measured using the 16-item Quick Inventory of Depressive Symptomatology Self-Report (QIDS-SR)⁴⁹. Scores were examined continuously from 0 to 27 to measure depression severity and also coded dichotomously as major depression (score >11) versus no depression (score ≤ 11).

Health-Related Quality of Life. Health-Related Quality of Life (HRQoL) was measured using the 36-item Medical Outcomes Study Short Form (SF-36), and physical and mental health-related quality of life composite sub-scores being calculated separately using norms-based scoring (mean=50, standard deviation=10) with higher scores representing perception of better health.⁵⁰ Scores were recorded as both continuous variables and as dichotomous variables with higher perceived physical and mental health (score >50) versus lower perceived physical and mental health (score ≤ 50).

Enabling resources included the following variables:

Perceived Social Support and Trust. This was measured continuously using a validated 31-item Social Support Scale (range is 0–100), with greater scores representing greater perceived social support.⁵¹ Trust in physicians was scored using an 11-item validated, five-point Likert scale, and the score was derived from a mean of the responses (range is 0–100), with higher scores representing greater trust⁵².

Access to and Retention in HIV Care. The definitions for retention in HIV care were defined based on previously described methods from an EnhanceLink study.¹⁴ Specifically, an HIV-related visit was one made to an HIV provider and linked to HIV-1 RNA testing. Retention in HIV care over the 6 months post-release was coded as a categorical, single explanatory variable, consisting of the following: (1) no retention; (2) early retention, a visit only within the first 90 days of release; (3) late retention, a visit only after 90 days but before 180 days post-release; and (4)

sustained retention, defined as having made visits both within the first 90 days post-release *and* during days 90–180.¹⁴

Treatment for Substance Use Disorders. Utilization of buprenorphine was defined by dates of buprenorphine prescription and follow-up voucher provision as previously described.^{15,53} Among those meeting criteria for opioid dependence and therefore eligible for buprenorphine, participants were categorized as follows: (1) offered buprenorphine but either did not undergo induction or completed less than the full induction, or (2) retained on buprenorphine, defined as those who received at least one dose of buprenorphine beyond the 7-day induction period, including those with multiple re-inductions.

Re-incarceration. Re-incarceration was defined as being re-detained at any point in the year following jail-release for each subject using objective incarceration data.

Statistical analysis

First, descriptive analysis was performed to characterize the sample, stratified by clinically meaningful categories of number of ED visits post-release (0 visits, 1–2 visits, 3–5 visits, 6–10 visits, greater than 10 visits). To address non-Gaussian distribution of the rate of ED use and the over-dispersed nature of the data, negative binomial regression was applied in multivariate models to determine covariates of ED use frequency.⁵⁴ Since 3.6 % of the data were missing at baseline, and approximately 44 % of subjects were missing CD4 counts and viral load measures at 6 month follow-up, we performed multiple imputations to generate an imputed dataset. Based on baseline characteristic comparisons of factors associated with not following up for research visits (e.g., substance use, homelessness, psychiatric conditions), we were able to assume that the data was missing at random (MAR), meaning the probability a variable is missing depends only on available information.⁵⁵ Although there are no definitive measures proving data were truly MAR,^{14,56} we used all available variables in the imputation dataset rather than just those ultimately used in the model.⁵⁷ We imputed five times as recommended⁵⁷ for each missing cell, and we used the average for regression analysis.

Based on the conceptual framework of the Behavioral Model, separate multivariate analyses of predisposing factors, need factors, and enabling/disabling resources were performed. Thereafter, a negative binomial regression model was determined using a forward stepwise elimination procedure including all potential covariates, with certain demographic variables (age, gender, and race/ethnicity) included a priori. Exposure time, defined as amount of time spent in the community post-release (less amount of time re-incarcerated) up to 12 months, was included as an offset variable to account for different length of observations. Akaike's Information Criterion (AIC) was used to discriminate fit among the various models.⁵⁸ In cases where both continuous and dichotomous variables were recorded, the analysis with the best fit by AIC was included in the multivariate analysis. Incidence rate ratios (IRR) with 95 % confidence intervals were reported, and *p* values of less than 0.05 were considered statistically significant. Multiple variables were evaluated for collinearity, but none were found to have a statistically significant interaction.

Survival analysis was then performed on time to first ED visit post-release, using Kaplan-Meier survival curve estimates, stratified by demographic characteristics.

Differences between groups were determined by log rank tests, and those subjects without any ED visits were censored. Cox regression analysis was then performed to determine correlates of time to ED use post-release. Assuming no a priori reason to include any specific variables, we fit a multivariate model with all significant bivariate correlates ($p < 0.20$), and then used multiple steps of backward and forward selection to prune the main-effects model with significance level $p < 0.05$.⁵⁹

Finally, the cohort was divided into “early” ED users, defined as those who made their first ED visit within 6 months post-release, and “late” users, defined as those who made their first ED visit after the first 6 months post-release or did not use the ED at all post-release. This distinction was made because a coordinated transition and engagement in HIV care may have had an impact on ED use in the early post-release period. The two groups were compared using paired t tests for continuous variables and chi-squared test for dichotomous variables with $p < 0.05$ defining statistical significance. All analyses were performed using statistical software R version 2.15.0, previously validated for multiple imputations.⁶⁰

RESULTS

Table 1 describes the baseline characteristics of the total analyzed sample of 109 participants, stratified by number of ED visits during the first 12 months post-release. Overall, 71 participants (65.1 %) sought care in the ED at least once in the 12 months following jail-release, with a mean of 2.75 ED visits per person-year. Concerningly, the 18 subjects in the cohort who visited the ED six times or more contributed 185 (61.7 %) of the 300 total ED visits, and the six subjects with more than 10 ED visits contributed 101 (33.7 %) of the 300 total ED visits.

Re-incarceration, in either jail or prison, during the 12 months following index detention was common, with 52.3 % of subjects being re-incarcerated. Re-incarceration was yet more common among those subjects who visited the ED six or more times, with 78 % of subjects re-incarcerated in the year following index detention.

Basic demographic characteristics of the cohort are generally representative of the incarcerated (both jailed and imprisoned) population of PLWHA in Connecticut.⁶¹ Specifically, the study participants were mostly single (60 %), male (70 %), in their mid-40s (mean age = 45.5 ± 7.6 years) who self-identified as Black (50.5 %) or Hispanic (27.5 %). Most had not completed high school, with average years of schooling being 10.5 ± 2.6 years. Sixty percent were never married. Forty-four percent stated that they expected to be homeless or have only temporary housing after release.

Nearly all (85.3 %) subjects had a CD4 count ≥ 200 , 68.2 % of subjects had achieved viral suppression before release and with regard to retention in HIV care post-release, only 47.7 % were continuously engaged in care. Most (75 %) of participants, however, had an HIV-related clinical visit at some point post-release, even if it was only a single visit in the first or second quarter post-release.

Table 2 depicts reasons for all ED visits post-release in this cohort. Based on provider diagnoses, half of all ED visits were for acute infections, 31 % involved substance use issues, 26 % involved acute pain, and 18 % were due to trauma.

Table 3 depicts multivariate models of frequency of ED use in the 12 months post-release. The stepwise elimination model was best fit compared to the regressions derived from predisposing, need, and enabling/disabling factors in the Behavioral Health Model. When compared with people who used the ED less frequently, those

TABLE 1 Baseline characteristics of participants, stratified by number of emergency department visits post-release from jail (*N*=109 unless otherwise noted)

	Total sample	0 visits	1 visit	2 visits	3–5 visits	6–10 visits	>10 visits
Total number of subjects	109	38	21	16	16	12	6
Total number ED visits	300	0	21	32	62	84	101
Mean number ED visits per person-year (sd)	2.8 (4.4)	0 (0.0)	1.0 (0.0)	2.0 (0.0)	3.9 (0.8)	7.0 (1.5)	16.8 (7.2)
Mean days of incarceration (sd)	117.0 (108.0)	115.6 (99.1)	111.0 (120.2)	157.3 (138.6)	106.4 (117.8)	93.7 (66.5)	117.2 (66.8)
Mean days to first ED visit (sd)	80.1 (84.2)	—	129.5 (113.4)	73.4 (56.1)	65.3 (63.1)	53.8 (61.6)	17.2 (21.0)
Mean days re-incarcerated (sd)	119.0 (91.9)	133.0 (90.7)	121.0 (90.3)	191.4 (117.2)	114.3 (102.6)	63.6 (35.0)	78.8 (75.0)
Reentry site							
New Haven (%)	63 (62.4)	14 (42.4)	13 (61.9)	11 (73.3)	11 (68.8)	9 (81.8)	5 (100.0)
Waterbury (%)	38 (37.6)	19 (57.6)	8 (38.1)	4 (26.7)	5 (31.3)	2 (18.2)	0 (0.0)
Predisposing factors							
Mean age (sd)	45.5 (7.6)	44.6 (7.2)	46.8 (6.8)	43.8 (8.9)	48.3 (8.7)	45.8 (5.5)	43.5 (10.0)
Sex							
Male (%)	76 (69.7)	27 (71.1)	16 (76.2)	11 (68.8)	13 (81.3)	6 (50.0)	3 (50.0)
Female (%)	33 (30.3)	11 (28.9)	5 (23.8)	5 (31.3)	3 (18.8)	6 (50.0)	3 (50.0)
Race/ethnicity							
Non-Hispanic White (%)	24 (22.0)	9 (23.7)	4 (19.0)	3 (18.8)	3 (18.8)	4 (33.3)	1 (16.7)
Non-Hispanic Black (%)	55 (50.5)	15 (39.5)	12 (57.1)	10 (62.5)	9 (56.3)	4 (33.3)	5 (83.3)
Hispanic (%)	30 (27.5)	14 (36.8)	5 (23.8)	3 (18.8)	4 (25.0)	4 (33.3)	0 (0.0)
Mean years of education (sd)	10.5 (2.6)	10.4 (2.9)	10.4 (2.7)	10.5 (2.8)	11.2 (1.8)	9.2 (3.0)	11.7 (0.8)
Marital status (<i>n</i> =107)							
Married (%)	12 (11.2)	7 (18.4)	3 (14.3)	1 (6.7)	0 (0.0)	0 (0.0)	1 (16.7)
Never married (%)	64 (59.8)	20 (52.6)	13 (61.9)	11 (73.3)	9 (60.0)	7 (58.3)	4 (66.7)
Widowed/divorced (%)	31 (29.0)	11 (28.9)	5 (23.8)	3 (20.0)	6 (40.0)	5 (41.7)	1 (16.7)
Anticipated housing status (<i>n</i> =100)							
Permanently housed (%)	56 (56.0)	23 (67.6)	14 (66.7)	4 (28.6)	10 (62.5)	3 (33.3)	2 (33.3)
Temporarily housed (%)	27 (27.0)	8 (23.5)	4 (19.0)	5 (35.7)	4 (25.0)	3 (33.3)	3 (50.0)

TABLE 1 (Continued)

	Total sample	0 visits	1 visit	2 visits	3–5 visits	6–10 visits	>10 visits
Homeless (%)	17 (17.0)	3 (8.8)	3 (14.3)	5 (35.7)	2 (12.5)	3 (33.3)	1 (16.7)
Lifetime history of interpersonal abuse (n=104) (%)	89 (85.6)	28 (77.8)	20 (95.2)	13 (86.7)	13 (86.7)	9 (75.0)	6 (100.0)
Hazardous drinking (n=106) (%)	47 (44.3)	17 (45.9)	11 (52.4)	4 (25.0)	7 (43.8)	5 (45.5)	3 (60.0)
Harmful drinking (n=106) (%)	32 (30.2)	10 (27.0)	9 (42.9)	2 (12.5)	5 (31.3)	4 (36.4)	2 (40.0)
Alcohol dependence (n=106) (%)	24 (22.6)	7 (18.9)	8 (38.1)	2 (12.5)	2 (12.5)	3 (27.3)	2 (40.0)
Opioid dependence (n=108) (%)	60 (55.6)	24 (64.9)	10 (47.6)	7 (43.8)	11 (68.8)	7 (58.3)	1 (16.7)
Drug use disorder, ASI>0.16 (n=103) (%)	49 (47.6)	21 (58.3)	9 (42.9)	5 (33.3)	6 (42.9)	7 (63.6)	1 (16.7)
Alcohol use disorder, ASI>0.17 (n=103) (%)	31 (30.1)	10 (27.8)	8 (38.1)	2 (13.3)	4 (28.6)	3 (27.3)	4 (66.7)
Psychiatric disorder, ASI>0.22 (n=102) (%)	70 (68.0)	23 (63.9)	15 (71.4)	11 (73.3)	8 (57.1)	8 (72.7)	5 (83.3)
Need factors							
Mean baseline CD4 count (sd)	495.1 (313.4)	526.7 (302.4)	393.2 (248.5)	395.9 (274.5)	629.6 (274.5)	454.7 (271.7)	638.7 (423.1)
Baseline CD4 <200 (%)	16 (14.7)	4 (10.5)	6 (28.6)	3 (18.8)	1 (6.3)	2 (16.7)	0 (0.0)
Mean 6-month CD4 count (sd)	485.1 (267.5)	577.6 (299.9)	513.3 (313.4)	383.5 (247.6)	546.2 (247.6)	397.6 (197.8)	354.7 (147.9)
6-month CD4<200 (n=61) (%)	9 (14.8)	0 (0.0)	2 (14.3)	3 (27.3)	1 (27.3)	2 (22.2)	1 (33.3)
Baseline VL suppression (n=107) (%)	73 (68.2)	26 (70.3)	10 (50.0)	12 (75.0)	10 (75.0)	10 (83.3)	5 (83.3)
6-month VL suppression (n=60) (%)	39 (65.0)	9 (64.3)	10 (71.4)	7 (70.0)	5 (50.0)	6 (66.7)	2 (66.7)
Any baseline substance use not including alcohol (n=103) (%)	68 (66.0)	26 (72.2)	13 (61.9)	7 (46.7)	9 (64.3)	9 (81.8)	4 (66.7)

Drug use severity, continuous (ASI) (sd)	0.171	(0.152)	0.221	(0.177)	0.133	(0.129)	0.119	(0.108)	0.128	(0.094)	0.253	(0.171)	0.079	(0.097)
Alcohol use severity, continuous (ASI) (sd)	0.150	(0.235)	0.142	(0.239)	0.157	(0.214)	0.057	(0.133)	0.125	(0.163)	0.224	(0.348)	0.335	(0.320)
Psychiatric severity, continuous (ASI) (sd)	0.394	(0.270)	0.375	(0.284)	0.435	(0.265)	0.432	(0.266)	0.309	(0.277)	0.417	(0.270)	0.415	(0.254)
Major depression (<i>n</i> =96) (%)	74	(77.1)	24	(70.6)	19	(95.0)	11	(73.3)	8	(61.5)	6	(75.0)	6	(100.0)
Mean physical HRQoL composite score (sd)	58.0	(29.8)	59.4	(31.0)	56.9	(32.0)	57.7	(30.3)	59.4	(29.6)	62.5	(26.4)	40.8	(25.8)
Physical HRQoL composite score > median (%)	54	(50.0)	19	(50.0)	11	(52.4)	8	(53.3)	9	(56.3)	6	(50.0)	1	(16.7)
Mean mental HRQoL composite score (sd)	46.4	(27.2)	46.8	(27.0)	42.5	(27.8)	43.5	(30.9)	52.0	(23.6)	45.3	(32.5)	52.7	(21.4)
Mental HRQoL composite score > median (%)	54	(50.0)	18	(47.4)	9	(42.9)	7	(46.7)	10	(62.5)	6	(50.0)	4	(66.7)
Enabling/disabling resources														
Mean social support score (sd)	64.9	(30.1)	62.7	(27.2)	55.4	(30.4)	68.0	(31.8)	82.2	(29.4)	60.3	(32.3)	66.0	(32.1)
Mean trust in physician score (sd)	65.5	(7.2)	65.3	(5.5)	65.1	(7.1)	64.8	(7.3)	62.8	(5.9)	66.4	(5.7)	74.8	(14.5)
Any HIV care during 6 months post-release	82	(75.2)	21	(55.3)	16	(76.2)	14	(87.5)	14	(87.5)	12	(100.0)	5	(83.3)
Early HIV care (%)	21	(19.3)	7	(18.4)	2	(9.5)	3	(18.8)	4	(25.0)	3	(25.0)	2	(33.3)
Late HIV care (%)	9	(8.3)	2	(5.3)	0	(0.0)	4	(25.0)	2	(12.5)	0	(0.0)	1	(16.7)
Sustained HIV care (%)	52	(47.7)	12	(31.6)	14	(66.7)	7	(43.8)	8	(50.0)	9	(75.0)	2	(33.3)
Retained on buprenorphine (<i>n</i> =60) (%)	21	(35.0)	6	(25.0)	4	(40.0)	4	(57.1)	4	(36.4)	3	(42.9)	0	(0.0)
Re-incarcerated, <i>n</i> (%)	53	(48.6)	16	(42.1)	9	(42.9)	7	(43.8)	7	(43.8)	10	(83.3)	4	(66.7)

sd standard deviation, ED emergency department, CD4 CD4 count, cells/microliter, VL viral load, ASI Addiction Severity Index, HRQoL Health-Related Quality of Life (measured by SF-36), SF-36 Medical Outcomes Study Short Form

TABLE 2 Patients’ reasons for visit and provider diagnoses for 300 post-release emergency department visits

Principal reasons for visit	Includes	Chief complaints		Provider diagnosis	
		No. visits	%	No. visits	%
Abdominal pain/nausea and vomiting		33	11.0		
Chest pain		10	3.3		
Respiratory problems	Shortness of breath, cough, hemoptysis	20	6.7		
Neurological problems	Altered mental status, agitation, seizures, syncope, loss of consciousness, lethargy, “found down”	38	12.7		
Medical other, not including pain	Extremity swelling, rashes, bites, abscesses	49	16.3		
Acute somatic pain not included in above categories		59	19.7	78	26.0
Trauma	Injuries, accidents, assaults, hypothermia, wounds	20	6.7	54	18.0
Mental illness	Depression, suicidal or homicidal thoughts, hallucinations	19	6.3	18	6.0
Substance use	Acute intoxication, overdose, requesting detoxification	44	14.7	94	31.3
Social access	Requesting medications or refills, “homeless”	8	2.7	20	6.7
Cumulative febrile syndromes	Acute infections, episodic diseases			150	50.0
Chronic diseases	Congestive heart failure, chronic obstructive pulmonary disease, hypertension, diabetes			27	9.0
Total		300	100.0	441	

who used it more frequently were more likely to be female (IRR 2.40 [1.36–4.35]), unstably housed (IRR 2.05 [1.16–3.67]) or homeless (IRR 2.22 [1.15–4.41]), and have used substances other than alcohol in the previous 30 days (IRR 2.47 [1.33–4.64]). Those who met the criteria for opioid dependence and were retained to buprenorphine used the ED more frequently. Lifetime drug severity was inversely associated with ED use frequency. Participants with self-perceived better physical health and those who had any post-release HIV care (inclusive of early, late, and sustained care) used the ED less frequently. Finally, participants who were re-incarcerated in the 12 months following release were 2.71 times more likely to use the ED more frequently than those who were not re-incarcerated. There was no statistically significant difference in frequency of ED use in terms of reported lifetime history of interpersonal abuse, hazardous drinking, HIV viral suppression or CD4 status, levels of trust in physicians, or perceived social support.

Timing to first ED use after release from jail is shown in Table 4. Those who were homeless used the ED sooner (HR 1.89 [1.01–3.53]) than those who were

TABLE 3 Multivariate correlates of frequency of emergency department use (N=109)

	Predisposing factors		Need factors		Enabling/disabling resources		Stepwise elimination	
	IRR (95 % CI)	p value	IRR (95 % CI)	p value	IRR (95 % CI)	p value	IRR (95 % CI)	p value
Predisposing factors								
Age	1.01 (0.97–1.05)	0.63	1.01 (0.96–1.05)	0.81	1.02 (0.99–1.05)	0.27		
Sex (male = ref)								
Female	1.24 (0.63–2.47)	0.51	1.91 (0.93–3.99)	0.06	1.44 (0.84–2.50)	0.19	*2.40 (1.36–4.35)	*0.001
Race/ethnicity (White = ref)								
Black	0.53 (0.23–1.22)	0.12	0.81 (0.38–1.69)	0.56	0.73 (0.35–1.49)	0.37		
Hispanic	0.34 (0.13–0.89)	0.02	0.59 (0.24–1.42)	0.23	0.75 (0.34–1.65)	0.44		
Years of education	0.96 (0.83–1.10)	0.47						
Marital status (married = ref)								
Never married	1.26 (0.42–3.50)	0.63						
Widowed/divorced	1.3 (0.40–4.04)	0.62						
Anticipated housing status (permanent = ref)								
Temporarily housed	1.33 (0.67–2.69)	0.39					*2.05 (1.16–3.67)	*0.02
Homeless	2.85 (1.26–6.82)	0.01					*2.22 (1.15–4.41)	*0.02
Lifetime history of abuse	1.43 (0.55–3.56)	0.42						
Hazardous drinking	0.85 (0.41–1.76)	0.61						
Opioid dependence	0.71 (0.33–1.50)	0.29					1.04 (0.58–1.90)	0.88
Need factors								
Baseline CD4 <200			0.41 (0.13–1.25)	0.09				
6-month CD4 <200			1.99 (0.73–5.79)	0.14				
Baseline VL suppression			1.03 (0.46–2.29)	0.94				
6-month VL suppression			1.27 (0.60–2.66)	0.51				
Baseline substance use not including alcohol			1.84 (0.84–4.03)	0.09			*2.47 (1.33–4.64)	*0.004
Drug use severity (ASI), continuous			0.07 (0–0.95)	0.03			*0.01 (0–0.10)	*<0.001
Alcohol use severity index (ASI), continuous			1.01 (0.26–4.16)	0.99				
Psychiatric severity (ASI), continuous			1.96 (0.5–7.8)	0.33				
Major depression			0.88 (0.4–1.91)	0.72				

TABLE 3 (Continued)

	Predisposing factors		Need factors		Enabling/disabling resources		Stepwise elimination	
	IRR (95 % CI)	p value	IRR (95 % CI)	p value	IRR (95 % CI)	p value	IRR (95 % CI)	p value
Physical HRQoL composite score			0.79 (0.4–1.58)	0.49			*0.60 (0.37–0.98)	*0.04
Mental HRQoL composite score			1.74 (0.87–3.55)	0.10			*2.00 (1.23–3.28)	*0.01
Enabling/disabling resources								
Social support score					1.00 (1.00–1.01)	0.30		
Trust in physician score					1.02 (1.00–1.03)	0.08	1.01 (1.00–1.03)	0.17
Any HIV care during 6 months post-release					0.83 (0.67–1.03)	0.07	*0.80 (0.65–0.99)	*0.03
Retained on buprenorphine					1.08 (0.55–2.16)	0.82	*2.35 (1.16–4.89)	*0.01
Reentry site (ref = New Haven)								
Waterbury					0.42 (0.24–0.74)	0.002		
Re-incarceration					2.52 (1.47–4.35)	<0.001	*2.71 (1.69–4.34)	*<0.001
AIC	487.73		486.90		462.41		450.05	

sd standard deviation, ED emergency department, CD4 CD4 count, cells/microliter, VL viral load, ASI Addiction Severity Index, HRQoL Health-Related Quality of Life (measured by SF-36), SF-36 Medical Outcomes Study Short Form

*p≤0.05

TABLE 4 Correlates of time to first emergency department visit after release by log rank

	HR (95 % CI)	<i>p</i> value
Predisposing factors		
Age	1.01 (0.98–1.04)	0.51
Sex (male = ref)		
Female	1.12 (0.67–1.85)	0.67
Race/ethnicity (White = ref)		
Black	1.11 (0.61–2.01)	0.73
Hispanic	0.69 (0.34–1.39)	0.30
Education	1.02 (0.93–1.11)	0.70
Marital status (married = ref)		
Never married	2.09 (0.83–5.27)	0.12
Widowed/divorced	1.78 (0.67–4.74)	0.25
Anticipated housing status (permanent = ref)		
Temporarily housed	1.2 (0.68–2.12)	0.52
Homeless	1.89 (1.01–3.53)	*0.05
Anticipated housing status (permanent or temporary = ref)		
Homeless	1.77 (0.98–3.2)	0.06
Lifetime history of interpersonal abuse	1.83 (0.84–4.01)	0.13
Hazardous drinking	0.93 (0.58–1.5)	0.76
Opioid dependence	0.73 (0.46–1.16)	0.18
Need factors		
Baseline CD4 <200	1.2 (0.64–2.23)	0.57
6-month CD4 <200	1.67 (0.8–3.48)	0.17
Baseline VL suppression	0.93 (0.56–1.53)	0.78
6-month VL suppression	1.2 (0.65–2.2)	0.56
Any baseline substance use not including alcohol	0.95 (0.58–1.57)	0.86
Drug use severity, continuous (ASI)	0.16 (0.03–0.82)	*0.03
Alcohol use severity, continuous (ASI)	1.16 (0.42–3.16)	0.78
Psychiatric severity, continuous (ASI)	1.16 (0.49–2.73)	0.74
Major depression	1.35 (0.72–2.53)	0.35
Physical HRQoL composite score	1 (0.99–1)	0.22
Mental HRQoL composite score	1 (0.99–1.01)	0.96
Enabling/disabling resources		
Social support score	1 (0.99–1.01)	0.53
Trust in physician score	1 (0.96–1.04)	0.86
Retention in HIV care (ref = no care)		
Early	2.22 (0.98–4.99)	0.06
Late	4.57 (1.73–12.04)	0.002
Sustained	3.17 (1.58–6.36)	0.001
6-month retention in HIV care	2.97 (1.52–5.82)	0.001
Retained on buprenorphine among those with opioid dependence	0.93 (0.51–1.71)	0.82
Reentry site (ref = New Haven)		
Waterbury	0.42 (0.25–0.71)	0.001
Re-incarcerated	1.5 (0.94–2.39)	0.09

For binomial variables, 0 or No is the referent group

* $p \leq 0.05$

permanently housed. Additionally, those who received any HIV care (inclusive of early, late, and sustained care) post-release, and more specifically, those subjects with

late and sustained care, used the ED sooner than those without any follow-up HIV care post-release (late retention HR 4.57 [1.73–12.04], sustained retention HR 3.17 [1.58–6.36]). As depicted in the Kaplan-Meier curves in Fig. 3, those who had late retention (seen only after 90 days of return to the community) and sustained (continuous) retention in HIV care visited an ED sooner (median 16 and 24 days, respectively) than did subjects who were not seen at all by an HIV provider (>50 % without ED visit at 12 months, $p=0.004$). Conversely, those subjects with higher drug severity tended to use the ED later than those with lower scores, and those subjects returning to the community of Waterbury, as opposed to the New Haven community, used the ED later. There were no significant differences in time to first ED visit based on history of interpersonal abuse, hazardous drinking, opioid dependence, HIV severity markers, or utilization of buprenorphine.

Early ED users were more likely to have been retained in HIV care, and specifically sustained care, at 6 months (Table 5). Late users were more likely than early users to have a higher perceived state of physical health (mean 63.3 ± 30.4 versus 50.6 ± 27.7 , $p=0.03$). Finally, early users were more likely to be returning to New Haven than Waterbury.

Multivariate correlates of time to first ED visit using Cox proportional hazards regression are listed in Table 6. Those who used the ED sooner were more likely to be homeless (HR 1.98 [1.02–3.84]) and have a higher lifetime history of interpersonal abuse (HR 3.37 [1.01–11.29]). Those who used the ED sooner were also more likely to have used a substance other than alcohol in the previous 30 days (HR 2.51 [1.30–4.87]) and to have been retained in HIV care at 6 months (HR 1.30 [1.04–1.61]). Conversely, individuals with higher drug use severity scores had a longer time to first ED use following release from jail than those with lower lifetime drug use severity scores (HR 0.01 [0–0.14]).

FIG. 3 Kaplan-Meier estimates of time to first ED visit following jail-release, stratified by retention in HIV care. Median time to ED use for no retention in HIV care ($n=27$), NA; median time to ED use for early retention in HIV care ($n=21$), 37.9 days; median time to ED use for late retention in HIV care ($n=9$), 16.3 days; median time to ED use for sustained retention in HIV care ($n=52$), 24.9 days.

TABLE 5 Characteristics of early and late emergency department visitors (N=109)

	Total sample		Early visitors		Late visitors		p value
	n or mean	% or sd	n or mean	% or sd	n or mean	% or sd	
Total number of subjects	109		45		64		
Total number ED visits	300		236		64		
Mean number ED visits per person-year (sd)	2.8	(4.4)	5.2	(5.7)	1.0	(1.7)	<0.001
Mean days of index incarceration (sd)	117.0	(108.0)	111.9	(110.0)	120.9	(107.2)	0.68
Mean days to first ED visit after release (sd)	80.1	(84.2)	28.1	(24.1)	170.1	(74.3)	<0.001
Mean days' duration of re-incarceration (sd)	119.0	(91.9)	122.2	(100.1)	115.4	(83.8)	0.79
Predisposing factors							
Mean age (sd)	45.5	(7.6)	45.5	(8.1)	45.5	(7.4)	0.97
Sex							
Male (%)	76	(69.7)	30	(66.7)	46	(71.9)	0.56
Female (%)	33	(30.3)	15	(33.3)	18	(28.1)	0.56
Race/ethnicity							
White (%)	24	(22.0)	10	(17.8)	14	(22.2)	0.97
Black (%)	55	(50.5)	25	(53.3)	30	(55.6)	0.38
Hispanic (%)	30	(27.5)	10	(28.9)	20	(22.2)	0.30
Mean years of education (sd)	10.5	(2.6)	10.9	(1.9)	10.3	(3.0)	0.22
Marital status (n=107)							
Married (%)	12	(11.2)	4	(8.9)	8	(12.9)	0.56
Never married (%)	64	(59.8)	29	(64.4)	35	(56.5)	0.31
Widowed/divorced (%)	31	(29.0)	12	(26.7)	19	(30.6)	0.31
Anticipated housing status (n=100)							
Permanently housed (%)	56	(56.0)	22	(51.2)	34	(59.6)	0.67
Temporarily housed (%)	27	(27.0)	11	(25.6)	16	(28.1)	0.95
Homeless (%)	17	(17.0)	10	(23.3)	7	(12.3)	0.13
Lifetime history of abuse (n=104) (%)	89	(85.6)	40	(90.9)	49	(81.7)	0.17
Hazardous drinking (n=106) (%)	47	(44.3)	20	(45.5)	27	(43.5)	0.85
Harmful drinking (n=106) (%)	32	(30.2)	14	(31.8)	18	(29.0)	0.85

TABLE 5 (Continued)

	Total sample		Early visitors		Late visitors		p value
	n or mean	% or sd	n or mean	% or sd	n or mean	% or sd	
Alcohol dependence (n=106) (%)	24	(22.6)	10	(22.7)	14	(22.6)	0.99
Opioid dependence (n=108) (%)	60	(55.6)	21	(46.7)	39	(61.9)	0.12
Drug use disorder (ASI) >0.16 (n=103) (%)	49	(47.6)	20	(46.5)	29	(48.3)	0.86
Alcohol use disorder (ASI) >0.17 (n=103) (%)	31	(30.1)	14	(32.6)	29	(48.3)	0.65
Psychiatric disorder (ASI) >0.22 (n=102) (%)	70	(68.0)	31	(72.1)	39	(65.0)	0.45
Need factors							
Mean baseline CD4 count (sd)	495.1	(313.4)	466.6	(272.1)	515.2	(340.1)	0.43
Baseline CD4<200 (%)	16	(14.7)	7	(15.6)	9	(14.1)	0.83
Mean 6-month CD4 count (sd)	485.1	(267.5)	467.1	(245.6)	507.9	(296.0)	0.56
6-month CD4<200 (n=61) (%)	9	(14.8)	6	(17.6)	3	(11.1)	0.47
Baseline VL suppression (n=107) (%)	73	(68.2)	28	(63.6)	45	(71.4)	0.40
6-month VL suppression (n=60) (%)	39	(65.0)	23	(69.7)	16	(59.3)	0.41
Any baseline substance use not including alcohol (n=103) (%)	68	(66.0)	30	(69.8)	38	(63.3)	0.50
Drug use severity, continuous (ASI) (sd)	0.171	(0.152)	0.146	(0.1)	0.189	(0.2)	0.14
Alcohol use severity, continuous (ASI) (sd)	0.150	(0.235)	0.155	(0.2)	0.147	(0.2)	0.85
Psychiatric severity, continuous (ASI) (sd)	0.394	(0.270)	0.402	(0.3)	0.387	(0.3)	0.78
Major depression (n=96) (%)	74	(77.1)	30	(78.9)	44	(75.9)	0.73
Mean physical HRQoL composite score (sd)	58.0	(29.8)	50.6	(27.7)	63.3	(30.4)	*0.03
Physical HRQoL composite score > median (%)	54	(50.0)	17	(37.8)	37	(58.7)	*0.03
Mean mental HRQoL composite score (sd)	46.4	(27.2)	47.4	(27.7)	45.8	(27.1)	0.76
Mental HRQoL composite score > median (%)	54	(50.0)	24	(53.3)	30	(47.6)	0.56
Enabling/disabling resources							
Mean social support score (sd)	64.9	(30.1)	64.8	(31.6)	64.9	(29.2)	1.00
Mean trust in physician score (sd)	65.5	(7.2)	64.8	(8.9)	66.0	(5.8)	0.45
Any HIV care during 6 months post-release	82	(75.2)	41	(91.1)	41	(64.1)	<0.001
Early (%)	21	(19.3)	7	(15.6)	14	(21.9)	0.41
Late (%)	9	(8.3)	6	(13.3)	3	(4.7)	0.14

Sustained (%)	52	(47.7)	28	(62.2)	24	(37.5)	*0.01
Utilization of buprenorphine							
Retained (%)	21	(35.0)	8	(17.8)	13	(20.3)	0.74
Reentry site							
New Haven (%)	63	(62.4)	34	(79.1)	29	(50.0)	*0.003
Waterbury (%)	38	(37.6)	9	(20.9)	29	(50.0)	*0.003
Re-incarcerated, n (%)	53	(48.6)	28	(62.2)	25	(39.1)	*0.02

p value is for t tests for continuous variables and chi-squared tests for categorical variables

sd standard deviation, ED emergency department, CD4 CD4 count, cells/microliter, VL viral load, ASI Addiction Severity Index, HRQoL Health-Related Quality of Life (measured by SF-36), SF-36 Medical Outcomes Study Short Form

*p≤0.05

TABLE 6 Multivariate correlates of time to first emergency department visit after jail-release (*N* = 109)

Variable	Exp(β)	(95 % CI)	<i>p</i> value
Anticipated housing status, permanent = referent			
Homeless	1.98	(1.02–3.84)	0.04
Lifetime history of abuse	3.37	(1.01–11.29)	0.05
Any baseline substance use not including alcohol	2.51	(1.30–4.87)	0.01
Drug use severity, continuous (ASI)	0.01	(0.00–0.14)	0.001
6-month retention in HIV care	1.30	(1.04–1.61)	0.02
Reentry site	0.57	(0.33–0.99)	0.05
New Haven = referent			
Waterbury			

ASI/ Addiction Severity Index

DISCUSSION

Though ED use among recently released, sentenced prisoners with HIV has been described³³, this study is the first to describe ED use among PLWHA released from jail. Additionally, this study is the first to describe correlates of time to first ED use among this markedly destabilized population, with exploration of ED use stratified by early and delayed utilization. The unstable period immediately following release from the CJS has been linked to ED use in this population, but this study further contributes to the literature by showing the proportion and frequency of ED service utilization by CJS-involved PLWHA, and elucidating those factors correlated with frequent and early ED use.

In this Northeastern US cohort, homelessness, a predisposing factor within the Behavioral Model, was a risk factor for both frequent and early ED use following release from jail. The interplay between homelessness and incarceration is well documented, with estimates of previous incarceration among homeless persons ranging from 23 to 68 %.^{62,63} Additionally, and importantly for this particular cohort in which housing status was defined by “anticipated” housing status after release, homelessness is a concern upon release because many individuals lose their housing during incarceration.⁶³ Homelessness, specifically among PLWHA, is associated with a greater reliance on the ED for health needs,^{30,64} having more advanced HIV,⁶⁵ and mortality.¹⁸ A recent study of PLWHA released from jail confirmed homelessness as being associated with SUDs, comorbid psychiatric conditions, lacking an HIV provider, and suboptimal ART adherence.³⁵ Our finding that homelessness in this same population is not only associated with higher frequency of ED use but also is associated with earlier ED use, provides further insights into the instability this population faces upon release. It also suggests that despite Housing and Urban Development’s definition of being homeless as not being housed in the previous 6 months and that jails and prisons are considered “housing,” incarceration magnifies the problems of housing instability by rendering incarcerated PLWHA ineligible for housing subsidies. Innovations in housing subsidies should instead target, rather than disallow, CJS-involved PLWHA for housing interventions immediately upon release.

This increasing realization of the need for supportive housing for this population should now drive public policy, through the implementation of a “Housing First” model for those released from jail. In some evolving programs, access to immediate and sustained housing is provided to justice-involved persons returning to the

community, and its provision is not contingent on compliance with other social services. A recent Ohio “Housing First” program for returning prisoners found that study participants had significantly lower re-incarceration rates than those not in the program.⁶⁶ Our study provides additional justification that such programs should be expanded to those released from jail, especially among PLWHA.

One disabling factor, re-incarceration, was associated with increasing frequency of ED use. A recent seminal study found high utilization of ED and hospitalization from a national survey of individuals with recent criminal justice involvement, but did not examine PLWHA.⁶⁷ During the immediate and destabilizing post-release period, the same vulnerabilities and behaviors (high rates of SUDs, comorbid psychiatric conditions) that lead to ED visits may also correlate with recidivism.^{9,35} Re-incarceration among PLHWA leaving the CJS is well-documented: among PLHWA released from prisons in Texas, annualized recidivism was 20.5 %.²¹ Of note, annualized re-incarceration rate in our cohort was 52.3 % at only 1 year, markedly higher than reported among prisoners in Texas, as well as higher than the 36.7 % 3-year re-incarceration rate for all Connecticut prisoners released in 2004 and included in the 2009 Connecticut Recidivism Study.⁶⁸ Our finding of a higher re-incarceration rate among PLHWA released from jails, as opposed to from prisons, may again reflect the fact that jail detainees have higher medical, psychiatric, and social comorbidity than sentenced prisoners are often released without a transitional plan afforded to prisoners, thus forcing them to return to unstable conditions upon release.

It seems that on its own, the programmatic linkage to HIV primary care from this study was insufficient to address the complex needs of this population, suggesting that invigorating efforts are needed to improve outcomes. Such efforts could include more intensive or frequent primary care contact immediately upon release⁶⁸ or with “dually based” providers,⁶⁹ or implementing medication-assisted therapies for alcohol and opioid dependence immediately upon jail entry and continuing it post-release. In a randomized controlled trial of an intensive linkage program among people without HIV in California, both groups had similar rates of primary care utilization after release from prison, but “Transitions Clinic” participants had a significantly lower rate of ED utilization.⁷⁰ A similar trial is currently underway in Australia.⁷¹ Notably, frequency of ED use was not associated with length of time of index detention or total duration of re-incarceration, and thus may point out that simply the act of being re-incarcerated and subsequently released again to the same socially vulnerable environment may contribute to increased ED use. Disturbingly, the finding that the 18 subjects who visited the ED six or more times had a re-incarceration rate of 78 % at 1 year would seem to support that hypothesis, and at a minimum, serves as a target for intervention. In another study of frequent ED use among PLWHA transitioning from prison (as opposed to jail), frequent use was defined as having only ≥ 2 ED visits per year, but was correlated with lower physical health-related quality of life and having not received pre-release discharge planning.³⁴ Further intensive study of this subset of very frequent ED users with ≥ 6 ED visits per year could identify unique characteristics and needs and guide an intervention.

Substance use immediately before incarceration, a potentially modifiable need factor, was associated with frequent and early ED use. The use of illicit drugs, including opioids, is associated with increased utilization of ED services,⁷² which may contribute in part to this population’s marginalization from, and therefore fragmented access to continuous care.^{72–74} Recent data also indicate that among

PLWHA released from prison, ED visits were more likely to be related to substance use and psychiatric comorbidities, when compared to the general population.⁷⁵ This high rate of substance use-related ED visits is borne out in this cohort, in which there is a discrepancy between patient-provided chief complaints and provider diagnoses of substance use (14.7 vs 31.3 %) were related to substance use, respectively. Post-release substance use and health care utilization has resulted from markedly slow uptake of implementing evidence-based treatment of SUDs in jail settings, including use of methadone, buprenorphine, or extended-release naltrexone (XR-NTX) for opioid dependence or NTX for alcohol dependence. In the case for PLWHA in community settings, being retained on buprenorphine results in numerous improved HIV treatment outcomes, including ART receipt and virological suppression.⁷⁶ This proof-of-concept has been verified among prison-released PLWHA,^{15,53} but not for jail detainees. Similarly, retention on buprenorphine in community-based cohorts is associated with a reduction in number of ED visits.⁷⁷ In this study, however, retention on buprenorphine was not significantly associated with a difference in timing of first ED visit, and retention to buprenorphine among opioid-dependent participants was, in fact, associated with increased frequency of ED visits. It should be noted, however, that in this complex population, the small sample size and definition of retention may have played a role in this unexpected finding. For example, only 21 subjects (35 % of those meeting criteria for opioid dependence) offered buprenorphine were ever induced on buprenorphine and retention included only receiving an additional prescription for buprenorphine beyond the initial 7-day induction. Future research with larger sample sizes is warranted to better disentangle buprenorphine retention.

Because considerable evidence suggests that SUDs are associated with increased ED use,^{72-74,77} it is surprising that in this cohort, increasing levels of lifetime drug addiction severity, another need factor, appeared protective against frequent and early ED use. One potential explanation is that addiction severity is scored over a lifetime, and our inclusion of pre-incarceration active (past 30 days) drug use is more important as a contributor to ED utilization outcomes. This finding would suggest that drug screening upon jail intake is crucial and that those who are actively using at the time of entry should be targeted for treatment and continuity of care. An alternative explanation is that people with long-standing drug use, despite having higher severity, are able to adapt to the destabilizing factors associated with incarceration and better able to cope with situations that would otherwise be chaotic.⁷⁸ Thus, in this cohort transitioning from jail, recent, rather than lifetime, drug use may be a more important predictor of instability and associated with ED use following release.

Findings from this study are in contrast to earlier studies of PLWHA and ED use in which increased HIV severity, defined using CD4 criteria, was associated with increased ED use. Here, no such association was found. Importantly, however, being linked to an HIV provider at any point in the 6 months post-release was associated with less frequent ED utilization. This may, in part, be explained by HIV clinics effectively engaging patients in primary care and seeing them for urgent visits in a timely manner. PLWHA with sustained and late retention in HIV care, however, visited the ED sooner than those not retained in care at all. One potential explanation is that among the 27 participants who had no retention in HIV care, over half did not have any ED visits over the 12 months of observation, either indicating that they either did not need (or did not perceive themselves to need) any kind of emergent or HIV care, or that they were profoundly disengaged from all systems of health care. Alternatively, those continuously engaged in HIV care, and

thus with more frequent contact with the health care system, have ongoing greater awareness of health care problems, and thus seek earlier ED evaluation. It may be that linkage to continuous care after release from jail causes an initial high consumption of all kinds of health care resources, but over time reduces use of fragmented ED care. Alternatively, it is possible that high frequency health care consumers use multiple types of resources in a complementary way to meet complex medical and psychosocial needs, particularly during periods of instability. The use of larger datasets able to better disentangle why patients used the ED (urgency, referral, after hours, etc.) is crucial to better understanding these findings.

Despite the many important findings reported, the study has several limitations. First, the sample size was small, derived from a single site and therefore region-specific, due to differences in substance use patterns, homelessness, and availability of supportive services. It therefore may not be representative of the entire population of EnhanceLink participants. Second, these findings are reported in the context of all study participants having received a linkage to care intervention that may have included linkage to other enabling services, which makes the exceptionally high rate of ED use all the more surprising. Third, it is possible that patients sought ED outside of the cities located and thus a small number of ED visits may have been inadvertently missed. It should be noted, however, that previous studies on ED use in Connecticut indicate that the data as presented likely account for the vast majority of ED visits.^{74,79} Fourth, buprenorphine retention relied on provision of vouchers and not on actual adherence data to confirm self-administration of medication or to monitor retention on buprenorphine beyond the first week of prescription; participants may have received treatment for SUDs elsewhere that we were not able to measure, contributing to misclassification bias. Last, there may be unmeasured factors, for example, health beliefs, that may contribute to an individual's perceived need for accessing care.

Notwithstanding these important limitations, this study provides for the first time, new and important insights into ED utilization among PLWHA with substantial medical, psychiatric, and social needs, reflected in the relatively large utilization of health care resources. It examines the interaction between frequency of ED use and the timing of the first ED visit, thereby demonstrating the necessity of implementing early intervention services, which could include housing provision, prevention of re-incarceration, provision of evidence-based drug treatment, and linkage to and retention in HIV care strategies, which should be applied ideally before leaving jail and continuing after release. While this research builds upon data for released prisoners, jail detainees are different in terms of their social instability, substance use, and psychiatric disorders and often have insufficient time to reflect upon their health care and social needs as they transition in and out of the CJS. Longitudinal cohort studies of released prisoners and jail detainees are warranted to better disentangle such differences and to introduce targeted interventions to improve health outcomes and reduce health disparities. Further domains for study of this population could include comparing prevalence of intimate partner violence with other forms of interpersonal violence, cost to the medical system of frequent ED utilization, and comparing ED use to a non-incarcerated cohort of PLWHA.

CONCLUSION

Among PLWHA released from jail, frequency of ED use is astonishingly high and is associated with other destabilizing factors, including active pre-incarceration

substance use and re-incarceration. Homelessness, a social condition that with changes in federal housing policy can be effectively addressed in CJS populations, predicts both frequent and early ED use. Importantly, linking and retaining PLWHA to care after jail-release is crucial, even if those engaged in care used ED services earlier, because “early users” utilized the ED less frequently overall during the 12-month follow-up period. Future interventions for this population should focus on immediate and sustained housing assistance, treatment for SUDs, and continued linkage to and retention in HIV care.

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