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Mental illness and neuropsychiatry of the homeless: Psychosis, personality, drug abuse, and other brain disorders

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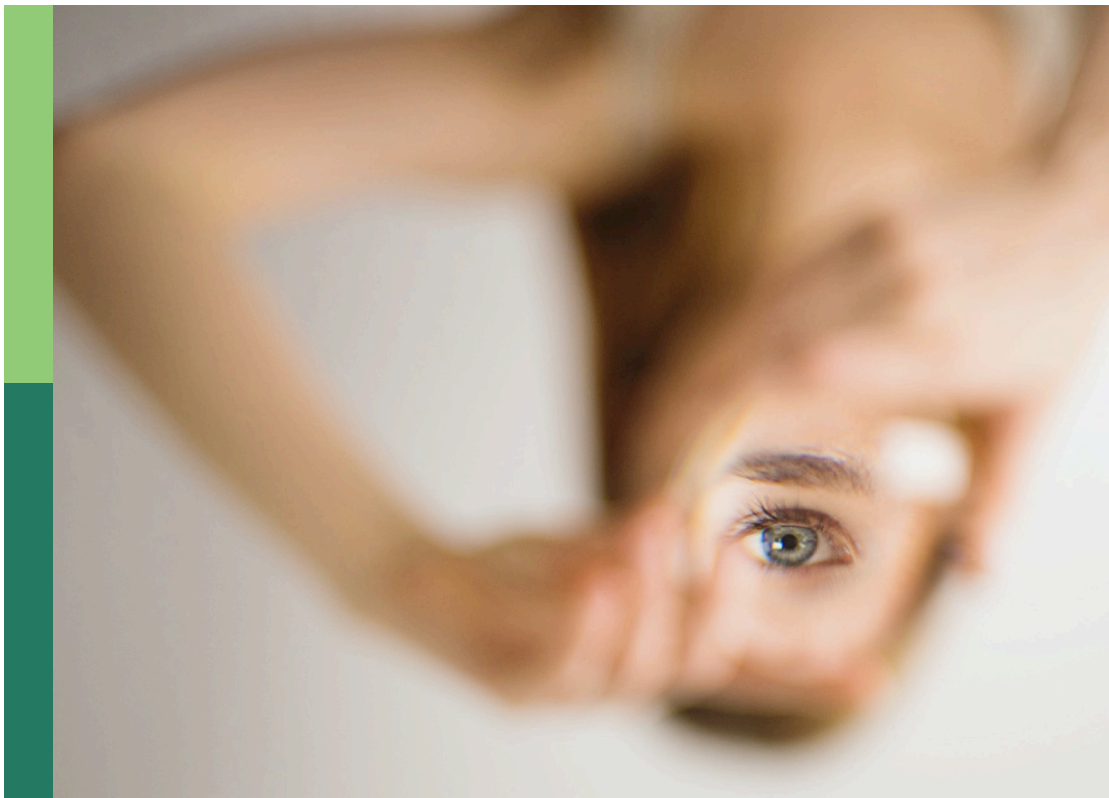

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Mental illness and neuropsychiatry of the homeless: Psychosis, personality, drug abuse, and other brain disorders

Topic editors

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Editorial: Mental illness and neuropsychiatry of the homeless: psychosis, personality, drug abuse, and other brain disorders

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Editorial on the Research Topic
Mental illness and neuropsychiatry of the homeless: psychosis, personality, drug abuse, and other brain disorders

The ailments of persons experiencing homelessness have been studied by clinicians, but also academics, from different backgrounds for many decades. A rapid search on PubMed, using the word homeless, revealed its first use by in 1888 (Henderson, 1888). Although the author might not have been the first one to use the concept, it seems that it was the first time the word appeared in this important database. Since then, many other works focused in the homeless. Today we celebrate three of those:

One hundred years of "the hobo: the sociology of the homeless man" by Nels Anderson

In November 2023 we celebrated the 100th anniversary of the seminal work "*The hobo: the sociology off the homeless man*" by Nels Anderson, a sociologist, that in 1923, Chicago, United States of America, distinguished hobos, tramps, bums and home guards (Anderson, 1923). In the following decades, countless authors realized the complexity of persons experiencing homelessness, exploring other concepts, such as vagrants (Kirchesch, 1950), skid rows (Myerson, 1953), runaways (Robins and O'Neal, 1959), urban nomads (Gropper, 1967), drifters (Bandler, 1967), squatters (Pataki-Schweizer, 1978), street people (Jones, 1983), throwaway people (Curtin, 1986), street youth (Côté, 1989), space cases (Fischer, 1992), gutter punks (Goetz, 2000), squeegees (Dachner and Tarasuk, 2002), etc.

Thirty years of "*Santé Mentale et Exclusion Sociale*" by Luigi Leonori

In December 2022 we celebrated, the 30th anniversary of the European organization *Santé Mentale et Exclusion Sociale (SMES)*, created by Luigi Leonori, a professor of Psychology, in 1992, Rome, Italy. He and his colleagues were worried about the social exclusion ("*Exclusion Sociale*"), of persons with mental health ("*Santé Mentale*") problems, experiencing homelessness (http://www.smes-europa.org/). Not only in Europe, persons experiencing homelessness have been labeled with a considerable number of different designations: *pixote* (Brazil), *gamino* (Colombia), *itinérants* (Canada), *clochard* (France), *puliukko* (Finland), *sans-abri* (France), *pennebruder* (Germany), *barboni* (Italy), *tunawisma* (Indonesia), *furosha* (Japan), *sin techo* (Mexico), *khate* (Nepal), *desamparado* (Peru), *sem-abrigo* (Portugal), or *BOMZI*, the acronym for *Bez Opredilyonogo Mesta Zhitelstva* (Russia), etc (Glasser, 1994).

Twenty years of *"Sem-Amor Sem-Abrigo"* by António Bento and Elias Barreto

In September 2022 we celebrated the 20th anniversary of *"Sem-Amor Sem-Abrigo"*, a book published in 2002, in Lisboa, Portugal, by the recently deceased António Bento (Gama Marques, 2024), a psychiatrist, and Elias Barreto, a psychologist. At the time, the authors interviewed a small sample of homeless men and found not a single case of secure attachment style, leading them to propose the loveless (*sem-amor*) hypothesis among the homeless (*sem-abrigo*) (Bento and Barreto, 2002). Interestingly, all around the world, many other authors also looked on persons experiencing homelessness, as human beings lacking other important things, besides love: jobless (Miller et al., 1970), rootless (Holden, 1975), houseless (Bailey, 1977), supportless (Lipton and Sabatini, 1984), defenseless (Farr, 1985), restless (McLaughlin and Pepper, 1990), familyless (Liebow, 1993), roofless (Newton et al., 1994), nameless

FIGURE 1
The sleeping ground of two of our psychotic patients, a middle age couple sharing, for more than a decade, a grandiose *folie a deux* with indescribable ruin and misery.

(Gama Marques and Bento, 2020a,b), healthless (Yen et al., 2009), shelterless (Burton et al., 2020), etc.

Here in Portugal, we have been trying to follow charismatic leaders, inspired by true homelessness champions who brought people together and held on to a vision (Pannel and Parry, 1999), such as António Bento and Luigi Leonori in Southwestern Europe, or Mitch Snyder (Snyder and Hombs, 1986) and Edwin Fuller Torrey (Fuller Torrey, 1988) in Northeastern America.

We published papers revisiting theoretical concepts such as marontology, comorbidity (Gama Marques and Bento, 2020a,b), super-difficult patients (Gama Marques, 2021), mortification and shelterization (Gama Marques, 2022a,b). We did reviews on homelessness and epilepsy (Pontes Silva and Gama Marques, 2023), schizoaffective psychoses (Spranger Forte et al., 2023), and attachment disorders (Neves Horácio et al., 2023). And we spread case reports of homeless patients with conditions such as haltlose personality disorder (Gama Marques, 2019), treatment resistant schizophrenia, organic psychosis, pellagra, Capgras delusion (Gama Marques, 2022a,b), Huntington chorea, John Doe and Diogenes syndromes (Gama Marques, 2023).

We have been doing interstitial or street psychiatry, while leading the Homeless Outreach Psychiatric Engagement for Lisboa (HOPE 4 Lisboa) (Monteiro Fernandes et al., 2022; Gama Marques et al., 2023). Figure 1 represents just an example of our work: the sleeping ground of two of our psychotic patients, a middle age couple sharing, for more than a decade, a grandiose *folie a deux* with indescribable ruin and misery.

The present Research Topic on Mental Illness and Neuropsychiatry of the Homeless: Psychosis, Personality, Drug Abuse, and Other Brain Disorders, compiles ten articles from both sides of the Atlantic Ocean, on five different Frontiers journals.

Frontiers in Human Neuroscience: an Original Research manuscript, by Rangu et al. (Oklahoma), describes a relation between head concussions and medication non-adherence; and a Brief Research Report, by Pluck (Thailand) raises a pertinent question: is executive dysfunction among the homeless a true impairment or just another case of frontal lobology?

Frontiers in Artificial Intelligence: an Original Research article, by Chapman et al. (Utah), assesses the longitudinal housing status, of patients, using electronic health record data.

Frontiers in Psychiatry: one Opinion by Bravo et al. (Portugal); and one Brief Research Report, by Herrera-Imbroda et al. (Spain), both regarding the problem of readmissions in the homeless population; one Mini Review, by Henriques-Calado and Gama Marques (Portugal) dedicated to personality disorders; and a Systematic Review, by Hird et al. (New Haven), looking at the approaches to improve medication adherence in the homeless population.

Frontiers in Psychology: a Community Case Study by Gabrielian et al. (California), on the engagement of stakeholders in a homeless veterans' program; and one Original Research article, by Oliveira Azevedo et al. (Portugal), dedicated to a harm reduction intervention with homeless people struggling with alcoholism.

Frontiers in Public Health: one Brief Research Report, by Catthoor et al. (Belgium) looking at the housing problems in admitted psychiatric patients.

We regret not having more articles published in this topic. Nevertheless, we hope our Research Topic' articles will stimulate future discussion regarding persons living and dying with psychiatric disorders and neurologic diseases while experiencing homelessness.

Author contributions

JG: Conceptualization, Investigation, Writing – original draft, Writing – review & editing. JH-C: Supervision, Validation, Writing – review & editing. MS: Supervision, Validation, Writing – review & editing.

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In Memoriam

Dr. António Bento, 1954–2023 (Lisboa, Portugal, European Union).

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Non-adherence to psychiatric medication in adults experiencing homelessness is associated with incurred concussions

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This study investigated the relationship between concussions and medication adherence among 247 adults experiencing homelessness in Oklahoma City, Oklahoma, who were prescribed medication for a psychiatric disorder. Participants were asked whether they had "ever experienced a blow to the head that caused a concussion," and medication adherence was measured by asking participants whether they had taken their psychiatric medication yesterday. The data were analyzed using univariate and multivariable logistic regressions. Results showed that more than half of the sample had a concussion history (61.9%), and homeless adults with a concussion history had higher odds of non-adherence to psychiatric medications compared with those who reported no concussion history [$OR = 2.13$ (95% $CI = 1.08, 4.18$)]. Findings suggest that medication non-adherence is associated with incurred concussions. Raising awareness among service providers of the relationship between traumatic brain injury and medication adherence may increase efforts to improve adherence in this underserved population.

KEYWORDS

medication adherence, mental health, traumatic brain injury, brain concussion, adults experiencing homelessness

Introduction

Homelessness is a pervasive issue in the United States. Nearly 1.5 million Americans spend at least one night in an emergency shelter or transitional housing each year, and many of these individuals suffer from major psychiatric disorders (Solari et al., 2016; Ayano et al., 2019). For example, some of the most common psychiatric disorders

in this population are schizophrenia spectrum disorders and major depression, and the prevalence of Schizophrenia (12.6 vs. 0.64%) and depression (12.6 vs. 6.7%) are substantially higher among adults experiencing homelessness than the general population (Gutwinski et al., 2021). Homeless adults are less likely to have access to psychiatric services than the general population (Kushel, 2001; Hwang et al., 2008) and even when treatment is provided, many homeless adults fail to adhere to the prescribed treatment (Coe et al., 2015; Hunter et al., 2015). Numerous studies have shown that around 25–35% of homeless adults prescribed medication will not stick to treatment. The primary reasons for non-adherence seem to be patient-related, such as running out of medication or poor self-management (Coe et al., 2015; Hunter et al., 2015). The management of major psychiatric disorders is profoundly affected by medication non-adherence (Farooq and Naeem, 2014) and non-adherence is associated with more hospitalizations, poor psychosocial outcomes and quality of life, and increased substance abuse and suicide risk (Novick et al., 2010; Ho et al., 2016). Therefore, it is essential to identify risk factors for medication non-adherence to improve mental health among homeless adults with psychiatric disorders.

Traumatic brain injuries (TBI), defined as an external force that disrupts or alters brain functioning, (Menon et al., 2010) are frequently reported by adults experiencing homelessness. A recent study found that the lifetime prevalence of TBI in homeless and marginally housed adults was 53.1%, and the lifetime prevalence of moderate or severe TBI was 22.5% (Kushel, 2001). TBIs impair cognition, particularly executive functioning, (Andersen et al., 2014; Karr et al., 2014) and a prospective study identified that even a mild TBI, also known as a concussion, is associated with significant structural changes to the brain that affect cognitive performance 1 year after injury (Zhou et al., 2013). Relatedly, numerous studies have shown that homeless adults with a history of TBI are more likely to have psychiatric disorders, use more emergency room services, report more unmet health care needs and memory concerns, and have more contact with the criminal justice system compared with those with no history of TBI (Hwang et al., 2008; Topolovec-Vranic et al., 2017; Stubbs et al., 2019).

No studies have determined whether TBIs are associated with medication adherence among homeless adults with psychiatric disorders despite TBIs being very common in this population (Hwang et al., 2008; Topolovec-Vranic et al., 2017). This study investigates the relationship between concussions and medication adherence among homeless adults who have been prescribed medication for a psychiatric disorder. We hypothesize that homeless adults with a concussion history will have a higher rate of non-adherence to psychiatric medication regimens compared with those who report no concussion history.

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Methods

This study is a secondary data analysis of a survey that was conducted at six homeless serving agencies, such as a day shelter or food bank, across Oklahoma City, Oklahoma, between July and August of 2016. Participants ($N = 610$) were recruited using flyers within each agency. Data from this survey were used previously to highlight the prevalence of modifiable health risk factors and investigated determinants of health among homeless adults living in Oklahoma City (Maness et al., 2019; Neisler et al., 2019; Taylor et al., 2019). Study eligibility requirements included: current homelessness, which was based on responses to questions related to the length of homelessness, place of current shelter, and reasons for homelessness. Participants who responded that they had been homeless for "0 months," slept in their "personal apartment or house" last night, or reported they were "not currently homeless" were deemed not homeless (Neisler et al., 2018). Other criteria included: age $\geq$ 18 years, receiving services at a homeless shelter, (Neisler et al., 2018) and at least a 7th-grade reading level as indicated on the Rapid Estimate of Adult Literacy in Medicine Short Form (Arozullah et al., 2007). For this study, only participants who self-reported being prescribed medication for psychiatric disorders (i.e., Posttraumatic Stress Disorder, Major Depression, Bipolar Disorder, Schizophrenia or Schizoaffective Disorder, and other Anxiety Disorders) were included in the analyses ($n = 247$; 40.5% of the total sample). Each participant completed a series of measures on a tablet computer *via* software that read the questions aloud to the participant. Participants were instructed to talk with study staff if they had trouble answering a survey question. Participants were compensated with a $20 department store gift card for their participation.

Measures

The independent variable, concussion history, was measured by asking participants whether they had "ever experienced a blow to the head that caused a concussion (Kay et al., 1993; Slaughter et al., 2003)." The dependent variable, medication adherence, was measured by asking homeless adults prescribed medication for Posttraumatic Stress Disorder, Major Depression, Bipolar Disorder, Schizophrenia or Schizoaffective Disorder, or other Anxiety Disorders whether they took their medication yesterday. Homeless adults often have more than one psychiatric disorder and may take numerous medications (Fazel et al., 2014). Therefore, we created a variable, which was included as a covariate in multivariable analyses to account for adults who were prescribed more than one medication for psychiatric disorders. Other covariates included self-reported race, sex, age, education, and insurance status.

TABLE 1 Participant characteristics ($N = 247$).

Variable	Concussion history		p
	No ($n = 94$)	Yes ($n = 153$)	
Race			
White	51 (54.3%)	93 (62.4%)	0.21
Non-white[a]	43 (45.7%)	56 (37.6%)	
Sex			
Male	50 (53.2%)	93 (60.8%)	0.24
Female	44 (46.8%)	60 (39.2%)	
Age	41.14 (SD = 11.7)	46.1 (SD = 11.5)	<0.01
Education			
High school degree or less	59 (62.8%)	104 (68.0%)	0.40
Some college or more	35 (37.2%)	49 (32.0%)	
Mental health history			
Schizophrenia or schizoaffective disorder	29 (30.9%)	43 (28.1%)	0.64
Posttraumatic stress disorder	42 (44.7%)	87 (56.9%)	0.06
Anxiety disorder	57 (60.6%)	109 (71.2%)	0.08
Major depressive disorder	86 (91.5%)	140 (91.5%)	0.99
Bipolar disorder	39 (41.5%)	77 (50.3%)	0.18
Substance use disorder	39 (41.5%)	74 (48.4%)	0.29
Number of prescribed psychiatric medications	2.4 (SD = 1.1)	2.6 (SD = 1.2)	0.26
Health insurance status			
No insurance	64 (68.1%)	97 (63.4%)	0.45
Any insurance	30 (31.9%)	56 (36.6%)	

SD, Standard deviation.
[a] African Americans (n = 42), Native Hawaiian or Other Pacific Islander (n = 2), American Indian/Alaska Native (n = 25), more than one race (n = 28), and Other (n = 2).
All variables have <1% missing data.

Analyses

Descriptive statistics were generated for independent and dependent variables and covariates. Next, univariate and multivariable logistic regressions were conducted to explore the associations between concussion history and medication adherence among homeless adults who were prescribed medication for a psychiatric disorder. These analyses were completed in SAS 9.4 (SAS, 2013).

Result

The sample of participants ($n = 247$) included in this study was primarily White (59.3%) and male (57.9%), with an average age of 44.2 years ($SD = 11.8$). Most homeless adults had education equal to or less than a high school diploma (66%), and most of the sample did not have health insurance (65.1%). More than half of the sample had a concussion history (61.9%), and many self-reported a history of a psychiatric disorder, including 29.2% with Schizophrenia or Schizoaffective Disorder, 52.2% with Posttraumatic Stress Disorder, 67.2% with an Anxiety Disorder, 91.5% with Major Depression, 47% with Bipolar Disorder, and 45.8% with a Substance Use Disorder (excluding tobacco use). There were no significant differences in self-reported psychiatric disorders among those with and without a concussion history (see Table 1 for additional details).

Overall, homeless adults with a concussion history had more than two times the odds of being non-adherent to their prescribed psychiatric medication (i.e., failing to take psychiatric medication on the previous day) compared with adults with no concussion history [$OR = 2.13$ (95% $CI = 1.08, 4.18$)]. As shown in Table 2, homeless adults with a concussion history had six times the odds of non-adherence (i.e., failing to take psychiatric medication on the prior day) to their prescribed medication for Schizophrenia or Schizoaffective Disorder compared with those with no concussion history [$OR = 6.45$ (95% $CI = 1.23, 33.83$)]. Similarly, homeless adults with a concussion history had more than quadruple the odds of non-adherence to their prescribed medication for Posttraumatic Stress Disorder compared with those with no concussion history [$OR = 4.14$ (95% $CI = 1.18, 14.49$)]. Among homeless adults prescribed medication for an

TABLE 2 Association between concussion history and medication non-adherence among homeless adults prescribed medication for a psychiatric disorder (0 = adherent, 1 = not adherent).

Dependent variable	Concussion history (No vs. Yes)[a]	
	OR (95% CI)	aOR (95% CI)[b]
Any psychiatric medication	1.64 (0.90, 2.99)	2.13 (1.08, 4.18)
Schizophrenia or schizoaffective disorder medication	3.69 (1.14, 12.00)	6.45 (1.23, 33.83)
Posttraumatic stress disorder medication	3.89 (1.19, 12.74)	4.14 (1.18, 14.49)
Anxiety disorder medication	2.34 (1.18, 4.64)	3.06 (1.41, 6.65)
Major depressive disorder medication	2.04 (0.98, 4.24)	2.00 (0.90, 4.39)
Bipolar disorder medication	2.51 (0.84, 7.48)	2.92 (0.87, 9.76)

Adherence to psychiatric medication is based on the question, "Did you take your X (Schizophrenia or Schizoaffective disorder, Posttraumatic Stress Disorder, Anxiety, Bipolar, or Major Depression disorder) medication yesterday." All analyses have <5% missing data.
OR, Odds ratio, CI, Confidence Interval.
[a] No concussion history is the reference group for analyses.
[b] Multivariable models were adjusted for race, sex, education, age, total psychiatric medication prescribed, and insurance status.

Anxiety Disorder, the odds of non-adherence to prescribed medication were three times higher among homeless adults with a concussion compared to those with no concussion history [$OR = 3.06$ (95% $CI = 1.41, 6.65$)]. There was no significant difference in the odds of non-adherence among homeless adults with and without a concussion history for those prescribed medication for depression [$OR = 2.00$ (95% $CI = 0.90, 4.39$)] or bipolar disorder [$OR = 2.92$ (95% $CI = 0.87, 9.76$)].

Discussion

This study aimed to investigate the relation between concussions and medication adherence among homeless adults prescribed medication for a psychiatric disorder. The results were mostly consistent with our hypothesis; homeless adults with a concussion history had higher odds of non-adherence to psychiatric medication related to Schizophrenia or Schizoaffective Disorder, Posttraumatic Stress Disorder, and anxiety disorder than those without a concussion history. Though the effect sizes were large for Bipolar and Major Depressive Disorder, we failed to detect a significant association. Overall, homeless adults with a concussion history have a higher risk than those without a history of non-adherence to psychiatric medications, though adherence varies by psychological diagnosis.

Overall, medication adherence is very low among adults experiencing homelessness, (Unni et al., 2014) and the high prevalence of TBIs in this population may further interfere with adherence. Homeless adults often self-report that poor self-management skills (35%) and forgetfulness (12%) are significant reasons for non-adherence to psychiatric medication and other treatments for psychiatric disorders (Coe et al., 2015). Poor self-management skills and memory loss may indicate deficits in cognitive performance and executive functioning, (Coe et al., 2015; Stone et al., 2019) which are strongly correlated with TBIs (Andersen et al., 2014). It may be sensible for clinicians to screen for TBI history before providing psychiatric medication to homeless adults with psychiatric disorders. Relatedly, the use of telemedicine, and adherence technologies, such as text messaging programs, adherence apps, and smart pill bottles, should also be considered as ways to boost medication adherence (Ennis et al., 2015; Thakkar et al., 2016; Steinkamp et al., 2019).

Results from this study should be cautiously interpreted because there are some notable limitations. First, the cross-sectional design of this study limits conclusions about causation. It is plausible that non-adherence to psychiatric medication could increase the odds of a concussion by influencing risk-taking behavior (Basit et al., 2020). More importantly, certain psychological disorders and health conditions, such as drug use disorders, Schizophrenia, and epilepsy, are associated with medication non-adherence and can affect cognitive performance, regardless of TBI or concussion history (Reddy et al., 2014). Further, these psychological and physical health conditions may also contribute to an adult experiencing a concussion. For example, a person with severe drug use disorder may experience a TBI during a bout of intoxication (Haddad et al., 2014). Future research needs to consider using prospective data to replicate the observed associations to reduce the bias inherent in cross-sectional design studies.

Second, this study used a one-item self-report measure of concussion and psychiatric disorders, and the self-reported history of Schizophrenia and schizoaffective disorders were measured in the same question. Future studies should consider measuring these variables using medical records or validated symptom inventories to obtain more objective and valid information about the history of TBI exposure and psychiatric disorders. Further, although these disorders share some characteristics (Weil et al., 2018) future studies should consider assessing Schizophrenia and schizoaffective disorders separately. Third, concussion severity was not assessed in this study, which may indicate greater cognitive impairment. Fourth, this study focuses only on medication adherence with psychiatric medication, and the findings may not generalize to homeless adults taking medication for physical disorders, such as epilepsy. Fifth, we did not use a validated measure for medication adherence, nor did we ask adults whether they had access to their psychiatric medication, a common factor associated with non-adherence to medication use within this population (Hartman et al., 2019; Richler et al., 2019).

Sixth, although some individuals may have recovered from their psychiatric disorder and no longer require psychiatric medication, some disorders, such as Schizophrenia, require long-term treatment (Moilanen et al., 2016) and the lack of a prescription for medication could also indicate poor medication adherence. However, we did not have enough information to identify these participants and therefore chose to limit the analyses to participants with an active prescription for psychiatric medication. Seventh, this sample was recruited solely from working with agencies that serve homeless adults. A small segment of adults who experience homelessness do not routinely seek services and may remain transient. This population may also have more difficulty adhering to medication than the adults actively seeking services. Finally, future studies should recruit a larger sample of homeless adults with psychiatric disorders. Though the observed effect sizes for medication adherence related to Major Depressive Disorder and Bipolar Disorder were large, more participants may be needed to detect a significant difference in the odds of medication adherence for these disorders among homeless adults with and without a concussion history.

In summary, the lifetime prevalence of TBI in homeless and marginally housed adults is 53.1%, which suggests that TBIs are a serious and common health problem affecting this underserved population (Stubbs et al., 2019). This study provides evidence that TBI may also be associated with health behavior, particularly medication adherence for psychiatric disorders. Medication adherence affects the management of psychiatric disorders (Farooq and Naeem, 2014) and TBIs may interfere with treating psychiatric disorders in homeless populations. Health care providers should consider assessing TBI history in this population when prescribing psychiatric medications. Early identification of TBI history could help improve medication adherence in the homeless population by allowing providers to provide resources and teach practical strategies for adherence when prescribing medications. For example, providers can give patients daily pill organizers, help patients set phone-based medication reminder alarms, automate prescription refills at their preferred pharmacy and/or automatically mail prescriptions to shelter caseworkers. There is also a need to educate neurologists and neurosurgeons about the prevalence and severity of TBIs within this population so that these medical professionals can be ready to address TBI history during emergency room visits. Overall, more research is needed to develop and evaluate interventions to improve medication adherence in this understudied and underserved population. Increasing medication adherence will improve mental health and may improve various health and psychosocial outcomes among adults experiencing homelessness (Farooq and Naeem, 2014).

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Institutional Review Board of the University of Oklahoma Health Sciences Center. The patients/participants provided their written informed consent to participate in this study.

Author contributions

MB designed the parent study. NR and AA formulated the research questions, hypotheses, and prepared the first draft of the manuscript. SF-P conducted the secondary data analyses for this study. All authors revised the first draft and approved the final manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Avoiding revolving door and homelessness: The need to improve care transition interventions in psychiatry and mental health

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Introduction

In this article, we highlight the need to implement care transition interventions to reduce the revolving door phenomenon (RD) in the general population and homeless patients (HP). We have looked at studies concerning: (1) RD, (2), its impact on HP, and (3) models of care transition interventions in psychiatry and mental health. We conclude with suggestions on improving care transitions in mental health and reducing the RD.

The revolving door phenomenon

Early hospital readmission is a problem worldwide and an adverse clinical care outcome (1–3). It is estimated to cost $17 billion yearly in the United States (US) (4). In high-income countries, 13% of psychiatric patients are readmitted after hospital discharge (5). In addition, 50% of all discharged psychiatric patients are readmitted within 1 year (6).

The term revolving door means multiple readmissions in a period of 30, 60, or 90 days, according to different studies (7). These patients consume up to 30% of health care resources, although they represent only 10% of the total number of patients (8).

The main factors linked to the RD phenomenon remain uncertain (9). Studies found that revolving door patients are younger, single, with low education and unemployed. They often suffer from psychosis and alcohol or other substance use (10, 11). Also, they have a younger age on disease onset, poor compliance to medication, more suicide attempts and voluntary admissions (12).

There are several reasons for the increase in hospital readmission. One of the main factors is the lack of support from the patient's environment or care system (13). Another cause is early patient discharge before reaching clinical remission and no coordination of medication with the patient or family. Also, a lack of care transition planning

and adequate communication among hospital staff, patients, family and primary care providers worsen outcomes (14).

Several treatment strategies reduce hospital readmission: (1) the use of long-acting injectable antipsychotics (15, 16), (2) maintenance electroconvulsive therapy (ECT) (17, 18), and (3) community-based interventions (discussed below). Patients undergoing ECT (19, 20) need a family member or caregiver to monitor them for 24 h after each session. Those without family or social support are vulnerable to RD. To solve this problem, in our department, they are admitted the day before the procedure. They undergo ECT and are discharged after 24 h. A care transition element will follow them up *via* telephone, reminding them of their schedule to ensure they do not miss their maintenance ECT.

The revolving door problem in the homeless population

Homeless people are a vulnerable population and the RD is especially high among them. They have more medical comorbidities and more mental health problems. A reason for these issues might be their lifestyle. They have more difficult access to health care in the community and do not receive adequate medical care (11, 21).

A large study across three US examined the association of homelessness with hospital readmissions. The four most common causes were: (1) mental illness, (2) peripartum complications, (3) cardiac diseases, and (4) diseases of the digestive system (21).

A study in Nicaragua focused on the gender issue in homelessness. The female population is in a particularly vulnerable position. The "revolving door to homelessness" is more prevalent since they spend multiple episodes living as homeless after having access to independent housing. Also, they had more barriers to finding regular work (22).

It was also shown that men remained homeless for longer periods. A larger proportion of them had alcohol use issues. They also spent time in prison. Women were more prone to use a regular place to spend the night. An important proportion of them suffered sexual violence as a minor. They also suffered intimate partner violence and physical violence as adults. Homelessness in women poses another problem. The children under their care have an increased risk of suffering sexual, physical, or verbal violence (22).

One-fourth to one-third of homeless persons have a severe mental illness. Schizophrenia, bipolar disorder, or major depression are the most prevalent conditions (23). The cost of hospital admissions for the homeless is much higher than in the general population. Homeless people with mental health problems are more likely to use acute and emergency services. Also, they are less likely to receive general primary care than other populations (24).

Mental illness is an independent risk factor for homelessness. Single adults with a major mental illness have a 25–50% risk of homelessness over their lifetime (10, 23). When homelessness and mental illness are combined, the burden on the health system increases. This results in four times higher use of the health services than the housed population (11). Homeless people display low access to community-based health services. Despite being a vulnerable population (with higher illness severity and a higher need for care continuity), they have poor care after discharge (11, 25).

Some authors proposed that homeless people with mental illness should become the object of Marontology. This term origins in the greek word *marontos* which means unwanted. This proposed field is an effort to provide a better response to the particular challenges of this population (26). Other authors suggested that a street Psychiatry rotation should be part of the residency in Psychiatry (27).

General models of care transition intervention

One of the better-known intervention models in general Medicine is the Care Transitions Intervention created by Eric Coleman and his team (28). It consists of enabling the patient and family to become independent by providing them with the tools and information required. It uses a transition coach that interacts with the patient and family and is based on four pillars: medication self-management, patient-centred record, follow-up and red flags. The transition coach visits the patient in the hospital and home after discharge. Later he follows-up the patient *via* telephone call for 28 days. According to this randomized controlled trial, this intervention reduced early readmission from 13.9% in the control group to 8.3% in the intervention group after 180 days (28).

A prospective cohort study centered on a care transition intervention showed a significant readmission rate reduction compared to the control group (20.0 vs. 12.8%, respectively). It was an intervention based on coaching to empower patients to manage their health and improve their communication with their providers. The complete intervention occurs across 30 days and includes a home visit within 3 days, a first telephone call within 7–10 days, and the final telephone call by day 30 (29).

Some effective care transition interventions in psychiatry and mental health

There is more research on care transition interventions in general Medicine than in psychiatry (30, 31). Nonetheless,

several studies have shown the positive impact of a care plan in the transition from acute mental health inpatient to community care (32–34).

According to a systematic review (31), effective interventions in psychiatry include several aspects, namely: (1) pre and post-discharged psychoeducation; (2) timely communication of the discharge plan to the outpatient provider; (3) pre-discharge medication education; (4) telephone follow-up, and (5) a transition manager.

In terms of care transition models in mental health, Ezra Susser's Critical Time Intervention (CTI) studies in New York (35) was one of the first to show long-term impact and be cost-effective in the prevention of homelessness. Each person was assigned to a CTI worker and provided community housing. The worker would give close support and build durable ties between patients and long-term supports (family, caregivers, psychiatrist, general practitioner). It included home visits, accompanying patients to appointments, giving support and advice and mediating conflicts between patients and caregivers.

Other CTI, showed a significant reduction in homelessness and in readmissions (34). This highlights the importance of strategies that include housing stability to reduce revolving door in the HP.

A network-based concept (32) integrates different health care specialists. This includes psychiatrists, specialized nursing staff and psychologists, social workers and pedagogues. An emphasis is given to psychosocial support and psychoeducation. Other features include socio-therapy, visiting care and family support. This program also includes specialist nursing to provide home treatment. There is cooperation with the hospital in case of admission. Crisis service is available 24/7 for patient and family. The psychiatrist is in charge of the therapy and is the preferred contact for the patient.

Another intervention showed improvements in mental and physical health status, substance misuse, and the number of hospital admissions. It offered case management, peer support, access to primary psychiatric care, and community services (33). Several studies have shown the positive impact of a care plan in the transition from acute mental health units to community care (32–34).

Discussion

The aggregate data suggest that much more studies about care transition in psychiatry should be conducted. Another note is that the revolving door phenomenon and homelessness remain marginalized. As improvement suggestions, we highlight the need to foster the teaching of care transitions approaches in the residency program of Psychiatry. The development of the subspecialty of Marontology should be considered to address the super difficult patients, revolving door and homelessness (36). There is much more to be done by the mental health services, institutions and the government. Integrative perspectives are relevant to a better knowledge of the mechanisms of mental illnesses (37). This approach merges the knowledge of different areas such as psychiatry and neuroscience, psychology, neuroimaging, and neurology, to name a few. The concept of care transition can be added to the integrative perspectives of mental illnesses.

Important measures of care transition include early follow-up consultation *via* telephone and home visits, psychoeducation, access to prescribed medications, accompanying appointments and bridging ties between patients and long-term supports, such as family members and medical professionals. In order to improve care transition, some initiatives to improve post-discharge outcomes should be encouraged. Care after discharge should be integrative and multidisciplinary.

A particular intervention for the homeless population that includes housing and social support is needed. These measures are cost-effective and have a significant impact in reducing hospital readmission.

Author contributions

JB and AS-d-S: writing, editing, and review. FB and MT: editing and review. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Engaging stakeholders to inform national implementation of critical time intervention in a program serving homeless-experienced Veterans

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The Veterans Affairs (VA) Grant and Per Diem Case Management "Aftercare" program provides 6 months of case management for homeless-experienced Veterans (HEVs) transitioning to permanent housing, with the aim of decreasing returns to homelessness. Implementing Critical Time Intervention (CTI)—an evidence-based case management practice—would standardize care across the 128 community-based agencies that provide Aftercare services. To prepare for national CTI implementation in Aftercare, guided by Replicating Effective Programs (REP), we conducted a four-site pilot in which we adapted a CTI implementation package (training, technical assistance, and external facilitation); characterized stakeholder perspectives regarding the acceptability and appropriateness of this package; and identified contextual factors that affected CTI implementation. We engaged a stakeholder workgroup to tailor existing CTI training and technical assistance materials for Aftercare. To provide tailored support for providers and leaders to adopt and incorporate evidence-based practices (EBPs) into routine care, we also developed external facilitation materials and processes. Over 9 months, we implemented this package at four sites. We conducted semi-structured interviews at pre-implementation, mid-implementation, and 6 months post-implementation, with HEVs (n = 37), case managers (n = 16), supervisors (n = 10), and VA leaders (n = 4); these data were integrated with templated reflection notes from the project facilitator. We used rapid qualitative analysis and targeted coding to assess the acceptability and appropriateness of CTI and our implementation package and identify factors influencing CTI implementation. Stakeholders generally found CTI acceptable

and appropriate; there was consensus that components of CTI were useful and compatible for this setting. To adapt our implementation package for scale-up, this pilot highlighted the value of robust and tangible CTI training and technical assistance—grounded in real-world cases—that highlights the congruence of CTI with relevant performance metrics. Variations in agency-level contextual factors may necessitate more intense and tailored supports to implement and sustain complex EBPs like CTI. Processes used in this pilot are relevant for implementing other EBPs in organizations that serve vulnerable populations. EBP scale-up and sustainment can be enhanced by engaging stakeholders to tailor EBPs for specific contexts; pilot testing and refining implementation packages for scale-up; and using qualitative methods to characterize contextual factors that affect EBP implementation.

KEYWORDS

homelessness, Veterans, case management, implementation science, evidence-based practice

Introduction

Stable housing is a critical social determinant of health. Compared to their housed peers, homeless-experienced adults have worse behavioral health outcomes, higher prevalence of medical illness, and premature mortality (Dunn et al., 2006; Balshem et al., 2011; Carnemolla and Skinner, 2021; Paudyal et al., 2021; Onapa et al., 2022); these disparities are compounded by fragmented systems of care and discrimination experiences (Stafford and Wood, 2017; Ponka et al., 2020; Markowitz and Syverson, 2021; Schreiter et al., 2021). In the Department of Veterans Affairs (VA), ending homelessness among military Veterans in the United States of America is a national priority. Over the past decade, the VA made robust investments to scale-up Housing First (Tsemberis et al., 2004), an evidence-based practice (EBP) that pairs subsidies for permanent housing with field-based supportive services, which is often credited for a 50% decrease in Veteran homelessness (Henry et al., 2020). Veterans who remain homeless despite these advances are extraordinarily vulnerable; many live on the streets or are otherwise unsheltered and have mental illness and/or substance use disorders (Henry et al., 2021). To further VA's goal of ending Veteran homelessness, there is a pressing need to understand contextual factors that impact the scale up and spread of EBPs in settings that serve HEVs, and to develop effective practices that support such EBP implementation.

Implementation of Critical Time Intervention (CTI)—an evidence-based (Susser et al., 1997; Herman et al., 2000, 2011; Social Programs that Work, 2018; Ponka et al., 2020), structured, and time-limited case management practice—can substantively reduce returns to homelessness and decrease psychiatric hospitalizations among HEVs. Although CTI is an effective means of coordinating services for homeless adults, few HEVs receive CTI. To prepare for planned scale-up, spread, and sustainment of CTI in diverse community-based organizations that serve HEVs, we conducted a CTI implementation pilot in four agencies that partner with VA to serve HEVs. Over 9 months, this pilot was intended to adapt a CTI training, technical assistance, and external facilitation (Ritchie et al., 2014), an established process of providing tailored support for providers and leaders to adopt and incorporate EBPs into routine care. With a lens toward optimizing CTI scale up, this community case study describes processes used to adapt the CTI training and implementation supports; characterizes multi-level stakeholder perspectives regarding the acceptability and appropriateness of this package; and identifies contextual factors that affected CTI implementation.

Context

The VA Grant and Per Diem (GPD) "Aftercare" program provides 6 months of case management for HEVs transitioning to permanent housing and not otherwise receiving case management, with the goal of decreasing returns to homelessness. This program launched in October 2019; services are provided by 128 community-based homeless service agencies across the nation that partner with VA to care for HEVs. Though Aftercare was designed to decrease HEVs' returns to homelessness, no specific case management paradigm is required in the program, resulting in significant practice variation across agencies.

Our policy partners at the GPD National Program Office identified CTI as an evidence-based, structured, and time-limited case management model that—if implemented nationally—would standardize and improve case management delivered in Aftercare. Our four-site implementation pilot aimed to inform plans for national implementation of CTI in Aftercare.

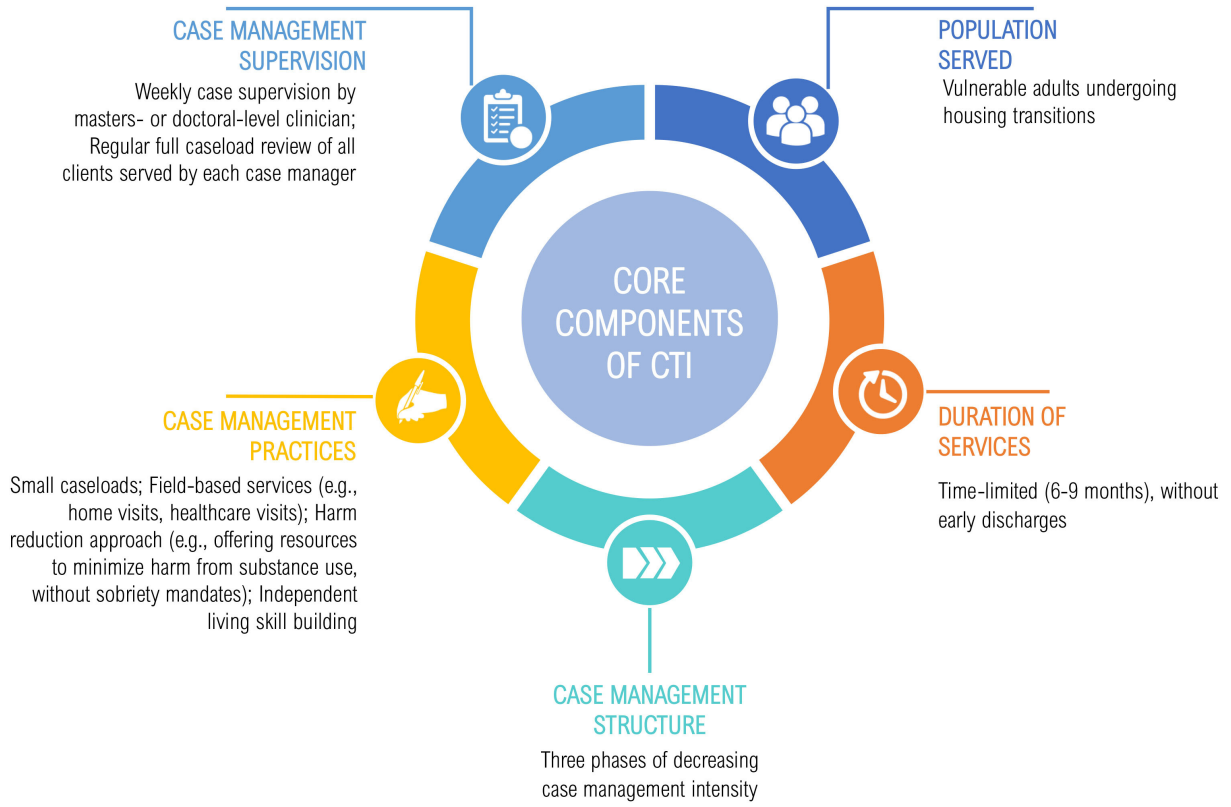

FIGURE 1
Core components of critical time intervention (CTI).

Detail to understand key programmatic elements

Figure 1 depicts the core components of CTI (Center for the Advancement of Critical Time Intervention, no date). Services are provided by a single case manager ("CTI specialist") who delivers field-based services that help clients mobilize resources and support. Services are time-limited (6–9 months) and delivered in three phases of decreasing case management intensity. Using a harm reduction approach, CTI focuses on coordinating services and supports to enhance housing stability and meet clients' recovery goals, while building skills required for independent living (Social Programs that Work, 2018). Though CTI specialists have a range of backgrounds and training (ranging from consumer providers to clinicians with master's degrees), supervision practices are standardized, with a clinician who has master's-level training reviewing all clients served by each case manager on a weekly basis.

There is strong evidence, including five randomized controlled trials (RCTs) (Susser et al., 1997; Herman et al., 2000, 2011; Social Programs that Work, 2018) and a systematic review (Ponka et al., 2020), that CTI improves housing stability and decreases psychiatric hospitalizations among homeless-experienced adults. Moreover, CTI was successfully implemented in 8 VA facilities for HEVs with serious mental illness, suggesting it is feasible and appropriate for scale up and spread within VA (Kasprow and Rosenheck, 2007), the nation's largest provider of services for homeless adults, many of whom have serious mental illness or other behavioral health disorders. However, little is known about strategies that support the implementation of complex case management practices in diverse community-based organizational settings that serve homeless adults. This implementation pilot aimed to fill these gaps, preparatory to a subsequent national implementation initiative. All pilot activities received a determination of non-research by the VA Central Institutional Review Board.

Adapting a CTI implementation package

Initial development of the CTI implementation package for Aftercare was guided by the Replicating Effective Programs (REP) framework (Kilbourne et al., 2014; Hamilton et al., 2017), which uses stakeholder input to enable packaging, training, and technical assistance of EBPs. REP was intended to enhance case

TABLE 1 Phases 1 and 2 of REP specified for a CTI implementation pilot in Aftercare.

Phase	Process	Products
I: Pre-conditions	• Select CTI as an EBP in partnership with national policy partners • Identify implementation barriers to CTI in Aftercare • Build a stakeholder workgroup that identifies CTI core components and adaptation options	• List of CTI's core components • Menu of options to adapt CTI for Aftercare
II: Pre-implementation	• Assemble CTI training, technical assistance, and implementation support package with stakeholder workgroup • Orient Aftercare program staff to CTI and plan for logistics • Pilot test and refine the CTI implementation package at four Aftercare sites	• Refined CTI implementation package for national scale-up and spread

managers' CTI skills and clinical competency, thereby enhancing CTI implementation.

Though REP has four phases (pre-conditions; pre-implementation; implementation; and maintenance and evolution) in total, only the first two apply to this implementation pilot (detailed in Table 1). Phases 3 and 4 will be encompassed in the planned national scale-up.

In Phase 1 (pre-conditions), we selected CTI in partnership with our policy partners and assembled a seven-member virtual stakeholder workgroup, comprised of CTI practitioners and trainers, local and national Aftercare clinicians and leaders, and HEVs. This group held four videoconference sessions (2 h each) to tailor, for the Aftercare context, a CTI training and technical assistance package recently implemented in homeless programs in Connecticut for homeless-experienced civilians (Critical Time Intervention/Rapid Re-housing Pilot, 2017).

First, the workgroup reached consensus on CTI's theory of change, i.e., the practice's core components (Figure 1). Next, we made practice adaptations to reflect the Aftercare context; for example, as case manager engagement with HEVs before Aftercare enrollment ("pre-CTI") is programmatically difficult, typical pre-CTI processes (e.g., gathering psychosocial data, establishing key recovery goals) were shifted to the first phase of CTI. As HEVs have higher rates of trauma and less social support than their homeless-experienced, non-Veteran peers (Tsai and Rosenheck, 2015), principles of trauma-informed care and social skill building, respectively, were included in CTI training and practice. Clinical vignettes presented in CTI training and technical assistance materials were adapted to reflect the diverse social circumstances, functioning, and diagnoses of HEVs in Aftercare. Additional adaptations were made in response to public health precautions imposed by the Coronavirus disease 2019 (COVID-19) pandemic, including the inclusion of virtual case management practices and strategies to address the "digital divide" that can impede health information access by vulnerable populations (Eruchalu et al., 2021). Additionally, all training and technical assistance materials were adapted for videoconference and/or in-person delivery, including an online toolkit and training slide decks.

In Phase 2 of REP, the final CTI implementation package (Table 2) was pilot tested at four Aftercare sites. This package consisted of: an intensive CTI training (six synchronous videoconference sessions led by expert CTI trainers); monthly communities of practice (CoP), i.e., one-hour discussions to deepen knowledge and expertise in CTI, attended by case managers and supervisors across all implementing Aftercare sites *via* synchronous videoconference; and on-demand telephone or videoconference case consultation with a CTI-trained clinician with expertise in HEVs. In addition, we developed external facilitation materials and processes; a facilitator trained in CTI and implementation facilitation provided tailored support *via* biweekly 30-min videoconferences with each site. These sessions aimed to build sites' organizational capacity to implement CTI and empower case managers to enact systems-based change that promotes CTI implementation (Lessard et al., 2016). The facilitator completed a templated reflection form after each call that included a summary of the call, successes of and challenges to facilitation, implementation strategies employed, and next steps.

Key stakeholder interviews to assess CTI implementation

A team of trained qualitative analysts conducted a total of 67 semi-structured telephone interviews (45 min each) across three time points: baseline (pre-implementation) and three- and six-months post-CTI implementation. Interviews were conducted with HEVs ($n = 37$) at baseline only. We interviewed Aftercare case managers ($n = 16$), supervisors ($n = 10$), and VA leadership ($n = 4$) across the four pilot sites at all three time points. We obtained verbal consent for all interviews. We provided confidentiality and privacy assurances as part of the consent process; interviews were analyzed in aggregate and all information linking individuals to interview data was destroyed prior to analyses.

Interviews with HEVs assessed their perceived needs and care experiences in Aftercare. Case manager and supervisor interviews were grounded in the Consolidated Framework

TABLE 2 CTI implementation package piloted at four Aftercare sites.

Component	Description	Delivery time
Intensive CTI training	Six synchronous videoconference sessions (2 h/week for 6 weeks)	Once, at the start of CTI implementation
Community of Practice (CoP) Sessions	Synchronous videoconferences to deepen knowledge and expertise in CTI, anchored in a brief presentation by the CoP leader or a guest speaker, followed by moderated interaction among Aftercare case managers and supervisors (1 h each)	Monthly, for 6 months, starting the month after the 6-session intensive CTI training is complete
On-demand case consultation with a CTI expert	Telephone call or synchronous videoconference to discuss an Aftercare case, with consultation grounded in fidelity to CTI (30 min each)	As needed by any Aftercare staff, throughout the 9-month implementation pilot
External facilitation	Implementation- and support-oriented activities, delivered *via* synchronous videoconference, tailored for each site (30 min each)	Every 2 weeks, for 6 months, starting the month after the 6-session intensive CTI training is complete

for Implementation Research (CFIR) (Damschroder et al., 2009), which consolidates constructs across a breadth of implementation science frameworks (Damschroder et al., 2009; Damschroder and Hagedorn, 2011) and is well suited to characterize factors influencing implementation outcomes. Baseline interviews assessed staff background and training, case management practices, and factors pertaining to the inner setting (organizational context) and outer setting (socioeconomic and political context) that might affect implementation success. Three- and six-month interviews characterized experiences with CTI training, perspectives regarding CTI's acceptability and appropriateness, and recommendations to enhance CTI implementation support.

Baseline interviews with VA leaders assessed their prior knowledge of CTI and assessment of CTI's general fit with Aftercare. At follow-up, VA leaders were asked to evaluate participating sites' CTI implementation and to make recommendations for improving the CTI implementation package. Of note, we included additional contextual data from the facilitator's reflections (n = 44), focused on her interpretations of each site's implementation successes and challenges.

All interviews were audio recorded and professionally transcribed. Using rapid qualitative analysis methods (Abraham et al., 2021), we created structured summaries of each interview organized by interview question and/or CFIR domains; and summaries of each facilitation session highlighting successes and challenges. We also created summaries by key stakeholder and implementing site (e.g., HEV perspectives from Site 1). We assessed satisfaction with CTI and our implementation package, as well as contextual factors (at the organizational or program level) influencing CTI implementation. We then conducted targeted in-depth coding using ATLAS.ti software, assessing the acceptability and appropriateness of CTI and our implementation package, and identifying factors influencing CTI implementation that were relevant for informing the planned national scale-up.

Acceptability and appropriateness of the CTI implementation package in Aftercare

CTI's core components were aligned with multi-level stakeholders' needs and goals. HEVs' stated goals for the Aftercare program were congruent with CTI principles, e.g., financial stability (*via* rental assistance, income and other benefits, budgeting), and engaging with mental and physical health care, employment, and legal assistance. VA leadership viewed CTI implementation as an opportunity to standardize and improve case management in Aftercare. Though case managers and supervisors had limited prior experience implementing EBPs, they desired case management training that was grounded in real-world cases. As one supervisor asserted, *"I want something tangible and realistic…I don't want another training on how to put a [Veteran's case] file together. I don't want anyone telling me the basics of case management."* Supervisors also desired clarity regarding Aftercare performance metrics and standardization of case management processes.

Overall, Aftercare staff were highly satisfied with the CTI training and found the content straightforward and helpful, albeit similar to other case management trainings. Most Aftercare case managers and supervisors had no knowledge of CTI prior to the intensive training. Post-training, case managers and supervisors at all sites described having some components of CTI in place at their organizations prior to the pilot; they believed that successful CTI implementation would require simple changes to existing processes: As described by a supervisor, *"For the most part, we were already doing the majority of [CTI] already, so it was a pretty seamless transition."*

Nonetheless, case managers and supervisors requested more opportunities to share practices and to engage in asynchronous learning; they also desired ongoing CTI training refreshers from a knowledgeable CTI trainer to strengthen newly acquired practice knowledge and to clarify content.

Case managers and supervisors described CTI as providing needed structure to case management practice and building case managers' skills. As one case manager stated, *"I really like that there's the three stages, two months each. I think it's a good way to organize the work that can be done with the Vets."*

Nonetheless, at 6 months post-implementation, all sites remained uncertain about how to implement specific CTI components, e.g., adapting clinical supervision practices and case consultation to support CTI adoption. Three of the four sites described limited buy-in for CTI's goal-focused and time-limited case management; these sites remained unconvinced throughout the pilot that a six-month case management practice was sufficient time to address the significant psychiatric, medical, and social needs of HEVs on their caseloads. Across the four sites, by six months post-implementation, case managers and supervisors felt that CTI was sufficiently implemented but that they needed more time for CTI to *"become second nature"* and to characterize factors relevant to its sustainment after the pilot's implementation supports ceased.

External facilitation targeted many of the sites' stated concerns about CTI's acceptability and appropriateness. The facilitator was instrumental in highlighting the differences between the sites' existing case management practices and CTI; the facilitator supported sites in making adaptations to CTI to fit their local contexts, while maintaining practice fidelity. Though Aftercare services are for 6 months, many agencies providing Aftercare were accustomed to long-term case management. CTI's core differences derived from its: time-limited nature; focus on recovery goals connected to HEVs' history of housing instability; and emphasis on care coordination. Transitioning to CTI case management required a shift in case managers' and supervisors' conceptualization of their roles and functions (i.e., redefining how successful case management looks under CTI) and the routinization of key CTI components into everyday case management practice (e.g., setting-focused recovery goals achievable in 2–6 months). As such, this implementation pilot highlighted areas that were insufficiently addressed by CTI training and technical assistance and required more robust support from facilitation.

Contextual factors impacting implementation across all pilot sites

The COVID-19 pandemic began shortly after the launch of the Aftercare program, with significant logistical impacts on CTI implementation. The pandemic led to: changes in Aftercare work structure (e.g., reduced in-home visits, increased telework); increased challenges coordinating services with VA and community-based agencies due to closures and staffing shortages; heightened barriers to stated recovery goals (e.g., finding employment, establishing mental health and medical services); and Aftercare staff burnout and turnover. As stated by a case manager, *"You are only as good as your resources. Once those are gone, you are doing things as creatively as you can."* These feelings were echoed by another case manager who said, *"There are some referrals where there is very little accommodation. They are your last shot, and they hang up. There are others where…they may say they'll talk to the Veteran and refer them [back] to you for additional services... There are varying degrees of how successful those warm handoffs are."*

In addition, all sites reported concerns complying with national Aftercare requirements related to HEVs' eligibility for the program (e.g., enrollment criteria described as too stringent) and HEV recruitment (e.g., perceived competition with other Aftercare sites for HEVs). As stated by a supervisor, *"We've been all over the [VA] campus letting them know that we're there and we're ready to take referrals. According to our case manager he's been met with some resistance because [the VA] provides some case management as well."*

TABLE 3 Summary of contextual factors that challenged CTI implementation at each pilot site.

Pilot site	Key contextual factors
Site 1	• Limited leadership engagement in CTI implementation • Lack of structured training and onboarding of the site's single case manager • Challenging team dynamics • Significant challenges recruiting HEVs into Aftercare
Site 2	• Organizational pressures to have large Veteran caseloads • Resistance to the six-month duration of the Aftercare program (deemed too brief for the complexity of HEVs enrolled)
Site 3	• Staffing shortages led to competing staff responsibilities within the agency but outside the Aftercare program • Engaged supervisor and well-functioning team • Case managers desired to provide psychotherapy and other clinical services, rather than focus on the CTI's core care coordination practices
Site 4	• Transient caseloads (HEVs often move out of the site's catchment area) • Long commutes are required for field visits that span two counties • More limited community-based resources and referrals than the pilot's urban sites • Supervisor turnover resulted in higher case consultation and facilitation needs

Across sites, case managers and supervisors expressed significant uncertainty about how "success" would be measured in Aftercare. There was a lack of clarity surrounding Aftercare's core functions; while there was an accepted programmatic aim to decrease returns to homelessness, key case management tasks that would enable this aim were often vaguely conceptualized. Few, if any, quality or performance metrics were conveyed by national leadership to staff at these pilot sites, leading to confusion about best case management practices to employ.

Staffing instability due to case manager and supervisor turnover at all sites resulted in varying degrees of CTI adoption among remaining staff. Two sites experienced supervisor turnover; one site was unable to identify a replacement during the pilot period and the other appointed an interim supervisor with limited slack. At times, supervisor turnover led to periods without clinical supervision, slowing case managers' supports and motivation to implement CTI. The remaining two sites experienced case manager turnover and/or illness requiring extended leave. Remaining staff often took over HEVs' cases managed by staff who left; at some sites, remaining staff also assumed responsibilities for training and onboarding new staff. For some case managers, increased administrative and clinical demands resulting from staff turnover limited their opportunity and motivation to adopt CTI.

Site-specific contextual factors influencing implementation

Contextual factors influencing CTI implementation also varied by site. Table 3 summarizes site-specific contextual factors that challenged implementation success. There were variations in case managers' backgrounds and training; some case managers were master's level clinicians (e.g., in family therapy or social work) and others were transitioning from other disciplines or were recent college graduates with limited case management experience. This breadth of backgrounds and training led to, at some sites, challenging case manager-supervisor dynamics. Less experienced case managers often were highly dependent on case consultation and clinical supervision. Beyond interpersonal dynamics, CTI implementation was also influenced by leadership buy-in, competing staff responsibilities, caseload sizes, geography and resource limitations, as well as incongruence between case manager beliefs and components of CTI practice.

Site 1 struggled with significant challenges recruiting HEVs into its program, poor leadership engagement in CTI implementation, and challenging team dynamics. The new and only case manager received minimal training at onboarding and was overwhelmed establishing relationships with VA and non-VA stakeholders to recruit HEVs to Aftercare. From the perspective of VA leadership, Site 1 struggled due to chronically small caseloads; in fact, this site had a caseload of zero HEVs for an extended period during our pilot, bringing CTI implementation to a standstill while the case manager focused on recruitment. Stakeholders at multiple levels described insufficient support from site leadership for CTI adoption. Our external facilitator recounted that Site 1 presented the most difficult team dynamics between the case manager and supervisors. The case manager verbalized needing supervisor support but was not always receptive to supervisor input.

Stakeholders at Site 2 struggled with high caseloads and some misalignment between staff beliefs and CTI principles. Case managers at this site described the most initial resistance to CTI, with the senior case manager remarking that 6 months was insufficient time to build rapport with HEVs and link them to necessary resources. As stated by a site supervisor, *"Six months doesn't seem to be long enough, if someone has a habit, they have had all their life, it's really hard to change it."* This site struggled to engage leadership in the implementation pilot and described organizational pressures to enroll more HEVs onto their caseloads, leaving case managers overwhelmed. Interview data suggested that addressing resistance to CTI may have benefitted from an in-person meeting with our implementation team (meetings were held virtually due to physical distancing precautions of the COVID-19 pandemic) and more intense external facilitation support.

Site 3 exhibited strong team dynamics but struggled with staffing shortages and challenges differentiating CTI practice from their baseline case management. Moreover, its experienced case managers expressed resistance to CTI's salient care coordination practices, asserting that linking HEVs to longitudinal resources without addressing their needs up front was inadequate case management (e.g., rather than linking a HEV to mental health services, these case managers wanted to provide psychotherapy themselves). Case managers and supervisors struggled to differentiate CTI's core components from baseline practice, challenging practice fidelity. Additionally, due to medical leave and staffing shortages, case managers were given additional duties that were outside the scope of Aftercare, which delayed CTI implementation.

Site 4 had the most unique challenges related primarily to its geographic location, compounded by supervisor turnover. As the site's case manager described, *"Unlike urban or dense [population] programs, we are covering two counties with one staff member… to get to a client, it can take 1 to 2 h on the highway."* The case manager and supervisor described HEVs on their caseload as transient; the case manager had to intentionally assess how familiar HEVs were with the area before linking them to resources. Long drives (>1 h) to and from HEVs' homes challenged the case manager's ability to connect with HEVs at the appropriate intensity for CTI. The

case manager expected these challenges to worsen as the number of HEVs in the program increased. It was also difficult for the case manager to "keep up" with changing community resources and network with other organizations over such a large geographic area. Despite these challenges, site stakeholders were motivated to use CTI, but required more case consultation and tailored implementation support from the facilitator when the supervisor left the organization.

Discussion

We conducted a pilot project to implement CTI in four community-based agencies that provide time-limited case management services for HEVs as part of VA's Aftercare program. This pilot was a valuable opportunity to assess early CTI implementation outcomes in different Aftercare settings and contexts; overall, Aftercare stakeholders found CTI acceptable and appropriate. There was consensus that components of CTI were compatible and useful for this setting, despite some concerns that remained salient throughout implementation. As we moved toward adapting our CTI implementation package for national scale-up, our findings highlighted the value of robust and tangible CTI training and technical assistance—grounded in real-world Veteran cases—that highlights the congruence of CTI with relevant VA performance metrics. Moreover, our data suggest that variations in agency-level contextual factors may necessitate more intense and tailored supports (e.g., external facilitation, case consultation, learning collaboratives) to implement and sustain complex EBPs like CTI. Table 4 summarizes key adaptations to our implementation package (i.e., CTI training, technical assistance, and external facilitation) for the national initiative that derives from this pilot. We anticipate that these adaptations will enhance key outcomes in the planned national implementation initiative, including CTI fidelity and sustainment. As CTI's effectiveness is influenced by fidelity to its core components, we also hypothesize that these adaptations will influence important quality metrics (e.g., housing stability, hospitalization rates, and HEV and case manager experiences).

These methods and findings have relevance for implementing other multi-faceted EBPs in diverse community-based organizations that serve homeless-experienced adults. While a breadth of EBPs (Munthe-Kaas et al., 2018; Pottie et al., 2020; Lowman and Sheetz, 2021; Semborski et al., 2021) [e.g., Housing First, harm reduction paradigms, and Assertive Community Treatment (multidisciplinary, team-based case management approach with assertive community outreach)] effectively address homelessness among adults with behavioral health disorders, it is immensely challenging to implement and sustain such practices with fidelity (Casey et al., 2013; Smelson et al., 2022; Tidmarsh et al., 2022). In this pilot, we used REP (Kilbourne et al., 2014; Hamilton et al., 2017) to engage multi-level stakeholders in a structured approaches to tailor an EBP for a specific context. We were able to refine training and implementation supports for this EBP using qualitative data that highlighted contextual factors that supported or impeded EBP implementation. Specifically, consistent with

TABLE 4 Adaptations to CTI implementation package in preparation for national scale-up.

Package component	Adaptations for national scale-up
CTI training and technical assistance	• Clarify key differences between CTI and traditional case management for HEVs • Enhance CTI training materials with more Veteran and VA-focused examples, including Veterans with psychiatric and medical complexities • Develop an online CTI toolkit as a central repository for CTI resources (e.g., CTI manual, progress note templates) • Develop an e-mail listserv to facilitate shared learning • Increase the frequency of CTI community of practice sessions, led by an experienced moderator (a CTI trained licensed clinical social worker leading sessions twice a month, up from monthly during the pilot) • Develop CTI "refresher sessions" to enhance practice sustainment when implementation supports cease • Foster shared learning among sites about successful recruitment practices • Develop a system to onboard new case managers and supervisors to CTI (given likelihood of staff turnover during implementation)
External facilitation	• Increase frequency of external facilitation calls (from biweekly to weekly) • Engage case managers and supervisors in early conversations about recruitment practices during external facilitation sessions • Use early facilitation calls to develop a structured site profile (e.g., site geography, staffing challenges, available resources, relationships with VA providers, knowledge of VA resources) to aid with implementation • Set realistic organizational expectations about caseload size, derived from CTI fidelity measures • Engage leadership early and often as part of external facilitation • Clarify agency and program-level performance metrics and support sites in using CTI to meet these metrics

Phases 1 and 2 of REP, we performed key steps (Kilbourne et al., 2014; Hamilton et al., 2017) that can be used across practices and settings to prepare EBPs for effective scale-up and spread: (1) assembled a stakeholder workgroup to identify the core components of an EBP and its adaptation options; (2) tailored the EBP, focused on its training and implementation supports, for the setting and context; (3) pilot tested the tailored EBP and its implementation supports; (4) used qualitative methods to gather stakeholder perspectives on the EBP and its implementation in the pilot; and (5) engaged in data-informed adaptations and refinements to the EBP. This approach is critical to ensure that complex EBPs—and their implementation supports (e.g., training, technical assistance, facilitation)—are optimally tailored and formalized prior to planned scale-up. These efforts can enable greater fidelity and sustainment, as well as effectiveness, in larger implementation initiatives. Though the implementation of EBPs requires a careful balance between tailoring interventions to contexts and maintaining fidelity to an EBP's core components (Von Thiele Schwarz et al., 2021; Wiltsey Stirman, 2022), we highlight the value of pilot work that tailors and enhances EBP training, technical assistance, and implementation supports to reflect relevant contextual factors.

Our data highlight the diversity of organizational characteristics and other contextual factors likely to support or impede EBP implementation for vulnerable populations. Consistent with a systematic review (Valenstein-Mah et al., 2020) that concluded that EBP training in isolation improves short-term provider satisfaction and EBP knowledge, but does not impact provider knowledge, we found that some Aftercare providers require more intense and costly supports to achieve CTI adoption. Yet, many community-based mental health and social service agencies that serve homeless-experienced persons rely heavily on EBP training alone, with clinical supervision, to enhance provider training and knowledge, as well as client outcomes. Particularly given profound deficits in community-based homeless service providers' workforce wellbeing, with high rates of burnout and turnover (Rollins et al., 2010; Salyers et al., 2013; Sullivan et al., 2015; Wirth et al., 2019; Peters et al., 2022), ensuring ample supports (e.g., training, technical assistance, facilitation) for EBP adoption is critical.

To date, little is known about organizational structures and characteristics, within and beyond homeless service agencies, that interact with provider capabilities, opportunity, and motivation, to influence EBP implementation (Michie et al., 2011; Mather et al., 2022). To fill this gap, our planned national implementation initiative will use a cluster randomized design to compare the implementation and effectiveness of two approaches to support CTI implementation across sites: CTI training and technical assistance alone (base implementation strategy) vs. CTI training and technical assistance enhanced by external facilitation (enhanced implementation strategy).

Acknowledgment of any conceptual or methodological constraints

This implementation pilot is limited by its focus on four community-based organizations that serve HEVs. These organizations, and the HEVs they serve, may differ from other Aftercare sites and HEVs, respectively, in other geographic regions. Of note, our findings are most applicable for organizations that partner with VA to serve HEVs; they may not extrapolate to other organizations and homeless populations. However, we suspect that methods used for this implementation pilot may benefit other EBP implementation initiatives for populations of homeless-experienced adults who do not use VA.

As a nine-month pilot at four sites, conducted during the COVID-19 pandemic, we were limited by our reliance on semi-structured interviews conducted by phone; we were unable to augment these data with site visits or in-person data collection with vulnerable HEVs who may not have access to phones. Moreover, aligned with our primary goal to adapt our implementation supports (training, technical assistance, and facilitation) for scale up, we intentionally focused our qualitative data collection efforts on providers; as such, we only interviewed HEVs at baseline. Follow-up interviews with HEVs, which we plan to conduct in the national implementation initiative, would provide critical information about how HEVs perceive the core components of CTI, as well adaptations to the practice that derived from our stakeholder workgroup. In addition, given the goals and scope of this project, the rich narratives provided by our semi-structured interview data allowed for a nuanced understanding of contextual factors that affected CTI implementation; however, additional structured data collection, e.g., structured and validated assessments of practice acceptability, would enhance our findings.

Of note, due to our project's sample size and timeline, we were unable to gather data about CTI's effectiveness as part of this pilot initiative; as CTI is a well-established EBP (Susser et al., 1997; Herman et al., 2000, 2011; Social Programs that Work, 2018; Ponka et al., 2020; Weightman et al., 2022), we relied heavily on existing data about practice effectiveness. However, the planned national implementation initiative will collect data about CTI's implementation and effectiveness by integrating qualitative and quantitative data.

Conclusions

CTI was successfully implemented in four agencies that provide Aftercare services for HEVs. This pilot used REP to inform adaptation, piloting, and refinement of a CTI implementation package that will be used in a national implementation initiative. Our data is well-aligned with literature suggesting that implementing EBPs in diverse settings requires balancing practice fidelity with adaptations that

accommodate contextual differences across settings (Chambers et al., 2013; Reed et al., 2018; Wiltsey Stirman et al., 2019). At some agencies, longitudinal implementation supports may be important to address key contextual characteristics that interplay with behavioral change factors (Michie et al., 2011) (i.e., capability, opportunity, or motivation) to influence CTI implementation. We plan to test more intense supports—and evaluate whether specific contextual factors are more likely to require such supports to implement and sustain CTI—in the planned national implementation initiative.

Data availability statement

All relevant data is contained within the article. The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by VA Central Institutional Review Board as a quality improvement activity. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

Author contributions

SG, KC, EF, DG, and TO-O contributed to the conception and design of this project. LH wrote sections of the manuscript. TH, RC, and JB contributed to data collection and analyses. All authors contributed to manuscript revision and read and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Risk of psychiatric readmission in the homeless population: A 10-year follow-up study

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Homelessness continues to be a major social and clinical problem. The homeless population has a higher burden of disease that includes psychiatric disorders. In addition, they have a lower use of ambulatory health services and a higher use of acute care. Few investigations analyze the use of services of this population group in the long term. We analyzed the risk of psychiatric readmission of homeless individuals through survival analysis. All admissions to a mental health hospitalization unit in the city of Malaga, Spain, from 1999 to 2005, have been analyzed. Three analyses were carried out: two intermediate analyses at 30 days and 1 year after starting follow-up; and one final analysis at 10 years. In all cases, the event was readmission to the hospitalization unit. The adjusted Hazard Ratio at 30 days, 1-year, and 10-year follow-ups were 1.387 ($p = 0.027$), 1.015 ($p = 0.890$), and 0.826 ($p = 0.043$), respectively. We have found an increased risk of readmission for the homeless population at 30 days and a decreased risk of readmission at 10 years. We hypothesize that this lower risk of long-term readmission may be due to the high mobility of the homeless population, its low degree of adherence to long-term mental health services, and its high mortality rate. We suggest that time-critical intervention programs in the short term could decrease the high rate of early readmission of the homeless population, and long-term interventions could link them with services and avoid its dispersion and abandonment.

KEYWORDS

homelessness, psychiatric readmission, health management, social psychiatry, psychopathology

1. Introduction

In the 20 years between the 1970s and 1990s, during the psychiatric reform, mental health hospital beds in Spain have been reduced by more than a quarter and long-term beds by a half (Aizpuru et al., 2008). A minority of hospitalized users make disproportionate use of inpatient mental health services (Vogel and Huguelet, 1997; Bowersox et al., 2012) which

represents a wide part of the cost of mental health services. Homeless users have increased use of acute mental health services (Dickey et al., 1996) and emergency services (Currie et al., 2018). This excessive use of services represents an important economic burden and decreases the quality of care. However, it is known that they use fewer primary care services and community mental health services. Although there are several studies about readmissions in mental health users (Vogel and Huguelet, 1997) and homeless users (Laliberté et al., 2020), there are few studies that analyze the risk of readmissions of homeless users in the long term, and, to the best of our knowledge, there are no studies in Spain about mental health hospitalization readmission in the homeless population.

The homeless population in Spain has been traditionally a stigmatized population. In fact, in 1933 was approved the "Ley de vagos y maleantes" (Law of lazy and thugs) (Presidencia del Consejo de Ministros, 1933) for the control of beggars and ruffians with no known occupation. This law was not derogated until 1995 and was applied as an important repression instrument in the Franco regime. The homeless phenomenon in Spain has increased a 25% in the last decade, as shown by data from the INE [*Instituto Nacional de Estadística (Statistical National Institute)*], the main Spanish agency in charge of the statistical services of the State (INE, 2022). The rate is the same in Spanish and migrants. Mental health problems are frequent among them, with more than fifty percent with depressive symptoms (INE, 2022). It is estimated that more than 3 of 4 homeless have a mental disorder, being the most common substance use disorders and schizophrenia spectrum disorders (Gutwinski et al., 2021). Also, mental health problems increase vulnerability to this condition (Sullivan et al., 2000). However, the characteristics of the homeless population admitted to mental health hospitals are scarcely known and deserve to be more deeply studied (Kent et al., 1995).

The aim of this study was to analyze the characteristics of admissions in the homeless condition in a mental health hospitalization unit and analyze the risk of readmission at 10-year follow-up period and, as secondary outcome, at 1 year and 30 days from discharge. Studying the characteristics of mental health inpatients and the risk for readmission could be useful to design better specific interventions for this population.

2. Materials and methods

2.1. Setting

This study has been carried out in a mental health hospitalization unit located in Malaga (Andalusia, Spain), near the city center. The unit has 42 beds for a catchment area of approximately 500.000 inhabitants. The study population consisted of all hospital admissions that occurred during the study period. This unit is part of the mental health care system within the Andalusian Health Service, which provides universal health coverage to all people living in the autonomous community. This system prioritizes a community care model where hospital admission is considered a last resort when other measures have failed, or the outpatient approach is not possible. The mental health department of the hospital also comprises other units such as two community mental health centers, 1 day center, one medium- and long-stay ward (30 beds), one child and adolescent mental health unit, an intensive community treatment team, a care team for first episodes of psychosis, and an eating disorders unit. On the other hand, this unit maintains frequent coordination with a public foundation, FAISEM [*Fundación Andaluza para la Integración Social del Enfermo Mental (Andalusian Foundation for the Social Integration of the Mentally Ill)*]. It provides socio-health support to users with severe mental disorders, such as supervised houses, day centers, etc.

2.2. Ethics statements

The hospital Ethics Committee approved the study. Informed consent was not deemed necessary because the information used for the study was obtained retrospectively from computerized admissions records and anonymity was guaranteed.

2.3. Design and variables

The design of the study had two parts: a first recruitment period, which included all hospital admissions that took place from January 1, 1999, to December 31, 2005; and a second follow-up period, when we carried out an up-to-10-years follow-up of each included admission during the recruitment period. When readmission occurred during this follow-up, it ended. Although many users were able to have multiple hospitalizations, for our analysis we focused only in the time from each admission in the recruitment period to the next admission of the same user during the follow-up. The follow-up data of the patients rest exclusively on the hospital records. No active follow-up of the patients was done.

The sample was divided into two groups: admissions of homeless users; and admissions of resident users. A total of 5,538 hospital admissions were identified during the recruitment period. Of these, in 755 there was no information in the records consulted on whether they corresponded to homeless users. Therefore, a total of 4,783 valid cases were finally included in the analysis.

For the survival analysis, the primary outcome was the time between the initial admission and the first readmission during the 10 years follow-up period. The secondaries outcomes were the time between the initial admission and the first readmission during the 30 days and 1 year follow-up periods. Patient data with no readmission during the follow-up period are considered to be censored.

The independent variable of the study was homelessness condition recorded at the time of admission. Also, the following sociodemographic and clinical variables were recorded in each group: age, sex, length of stay, diagnosis, type of admission (urgent or scheduled), and legal status of admission (voluntary or involuntary). For the variable "diagnosis," the different final diagnoses made by psychiatrists at discharge [ICD-10 (*International Clasification of Diseases 10th Edition*) diagnostic labels] were used. For the analysis, wide diagnosis categories were used. These categories were: "substance use disorders" (F10–F19), "bipolar disorders" (F31), "psychotic disorders" (F20–F29), "personality disorders (F60–F69)", and "other disorders (F00–F09, F32–F39, F40–F49, F50–F59, F70–F79, F80–F9, F-90–F99)".

2.4. Statistical analysis

A descriptive analysis of the variables was carried out in both groups. For the quantitative variables (age and length of stay) the mean and standard deviation were calculated and the differences between groups were analyzed using the Mann-Whitney *U* test as the distribution did not follow a normal distribution (Shapiro-Wilk test). For the qualitative variables (sex, diagnosis, type of admission, and legal status of admission) the frequency and percentage in each category were calculated and the differences between groups were analyzed using the Chi-Square test. Univariate survival analysis was carried out and a Kaplan-Meier curve was calculated. Three survival analyses were performed: two intermediate analyses at 30 days and 1 year; and one final analysis at 10 years. In all cases, the event was readmission to the hospitalization unit. Subsequently, a multivariate Cox regression analysis for each follow-up period (30 days, 1 year, and 10 years) was carried out. Survival analysis and Cox regression are very useful statistical tools used in life and health sciences when we want to measure time-to-event outcomes, as they offer more information than simply whether or not an event occurred (Benítez-Parejo et al., 2011; George et al., 2014).

We carried out an *a priori* analysis based on the literature consulted of those variables that could behave as potential confounders. Based on this analysis, in addition to the homelessness condition, variables sex, age (without statistically significant differences between the groups), and length of stay and diagnosis (with statistically significant differences between the groups) were included in the model. For the variable "diagnosis", personality disorders were used as a reference category, since its effect on psychiatric readmission has already been established in previous studies (Vigod et al., 2015). Since we did three comparisons, we applied for the main outcome and for the secondary ones a Bonferroni correction and the significance threshold was set to $\alpha = 0.017$ ($\alpha/3$). SPSS version 25 (IBM Inc., Armonk, USA) was used to carried out the analyses.

3. Results

Of the total sample analyzed, 200 admissions (4.2%) corresponded to homeless users, and 4,583 admissions (95.8%) corresponded to resident. In the homeless group, the mean age was 39 years with a standard deviation of 11, and the mean length of stay was 10 days with a standard deviation of 14. In the resident group, the mean age was 39 years with a standard deviation of 13, and the mean length of stay was 12 days with a standard deviation of 14. For both groups, the most frequent categories for the variables sex, diagnosis, type of admission, and legal status of admission were, respectively, "male" (59.5% in homeless group; 66.1% in resident group), "psychotic disorders" (F20–F29) (27.1% in homeless group; 35.5% in resident group), "urgent admission" (92.5% in homeless group; 90.9% in resident group) and "involuntary admission" (84.9% in homeless group; 88.3% in resident group). Statistically significant differences between the groups were found for the variables length of stay and diagnosis. Detailed information regarding the sample is displayed in **Table 1**.

For the univariate analysis, the results are shown in **Table 2**. **Figure 1** represents the survival function using a Kaplan-Meier curve. For the multivariate analysis, a summary of these data can be found in **Table 3** and detailed data can be found in **Supplementary Tables 1–3**. The diagnostic category "personality disorders" (F60–F69) was consistently associated with an increased risk of readmission, finding significant differences with the categories "substance use disorder" in all follow-up periods and with the category "psychotic disorders" at 30 days and 365 days of follow-up. Below we detail the most important findings for the main and secondary outcomes.

3.1. 10 years follow-up (main outcome)

The frequency (and percentage) of readmission was 116 cases (58%) for the homeless group and 3,134 cases (68.4%) for the resident group.

In the univariate analysis for the 10-year follow-up period, an unadjusted Hazard Ratio (uHR) of 0.835 [95% CI = (0.694–1.006)] was calculated for the homeless group. The mean survival time was 1695.145 days [95% CI = (1456.491–1933.799)] for the homeless group; and 1425.221 days [95% CI = (1378.782–1471.660)] for the resident group. These differences were not statistically significant on the test of equality of survival distributions (Log Rank p value = 0.057).

In the multivariate analysis for the 10-year follow-up period, an adjusted Hazard Ratio (aHR) of 0.826 [95% CI = (0.686–0.994)] was calculated for the homeless factor. In this model, statistical significance was only nominally achieved, with a p-value of 0.043. As for other categorical variables present in the Cox regression, differences in sex and some diagnostic categories were statistically significant.

3.2. 30 days follow-up (secondary outcome)

The frequency (and percentage) of readmission was 49 cases (24.5%) for the homeless group and 846 cases (18.5%) for the resident group. In the univariate analysis for the 30-days follow-up period, an unadjusted Hazard Ratio (uHR) of 1.422 [95% CI = (1.066–1.897)] was calculated for the homeless group. The mean survival time was 24.605 days [95% CI = (23.216–25.994)] for the homeless group; and 26.617 days [95% CI = (26.387–26.848)] for the resident group. These differences were statistically significant on the test of equality of survival distributions (Log Rank p value = 0.016).

In the multivariate analysis for the 30-days follow-up period, an adjusted Hazard Ratio (aHR) of 1.387 [95% CI = (1.038–1.853)] was calculated for the homeless group. In this model, marginal statistical significance was achieved, with a p-value of 0.027. As for other categorical variables present in the Cox regression, differences in some diagnostic categories were statistically significant.

3.3. 1-year follow-up (secondary outcome)

The frequency (and percentage) of readmission was 96 cases (48%) for the homeless group and 2,236 cases (48.8%) for the resident group.

TABLE 1 Baseline variables.

		Homeless [*n* = 200 (4.2%)]	Resident [*n* = 4,583 (95.8%)]	*p* value
Age [Mean (SD)]		39 (11)	39 (13)	0.696[a]
Sex [n (%)]	Male	119 (59.5%)	3027 (66.1%)	0.054[b]
	Female	81 (40.5%)	1553 (33.9%)	
Length of stay [Mean (SD)]		10 (14)	12 (14)	**0.008**[a]
Diagnosis [n (%)]	Substance use disorders (F10–F19*)	39 (19.6%)	538 (11.8%)	<**0.001**[b]
	Bipolar disorders (F30,F31*)	36 (18.1%)	584 (12.8%)	
	Psychotic disorders (F20–F29*)	54 (27.1%)	1622 (35.5%)	
	Personality disorders (F60–F69*)	38 (19.1%)	413 (9.1%)	
	Other disorders (F00–F09, F32–F39, F40–F49, F50–F59, F70–F79, F80–F9, F-90–F99*)	32 (16.1%)	1406 (30.8%)	
Type of admission [n (%)]	Urgent admission	185 (92.5%)	4166 (90.9%)	0.440[b]
	Scheduled admission	15 (7.5%)	417 (9.1%)	
Legal status of admission [n (%)]	Voluntary admission	30 (15.1%)	531 (11.7%)	0.149[b]
	Involuntary admission	169 (84.9%)	4007 (88.3%)	

[a]*p* value from Mann-Whitney *U* test; [b]*p* value from Chi-Square test; *Diagnostic labels from ICD-10 (International Classification of Diseases). Bold values correspond to significant results.

TABLE 2 Kaplan-Meier survival analysis.

	30 days			1 year			10 years		
	N cases (%) of readmission	Mean survival (CI 95%)*	uHR (95% CI)/ *p* value**	N cases (%) of readmission	Mean survival (CI 95%)*	uHR (95% CI)/ *p* value**	N cases (%) of readmission	Mean survival (CI 95%)*	uHR (95% CI)/ *p* value**
Homeless	49 (24.5%)	24.605 (23.216–25.994)	1.422 (1.066–1.897)/0.016	96 (48%)	228.440 (206.590–250.290)	1.022 (0.833–1.253)/0.836	116 (58%)	1695.145 (1456.491–1933.799)	0.835 (0.694–1.006)/0.057
Resident	846 (18.5%)	26.617 (26.387–26.848)		2236 (48.8%)	231.576 (227.168–235.984)		3134 (68.4%)	1425.221 (1378.782–1471.660)	
Overall	895 (18.7%)	26.533 (26.305–26.762)		2332 (48.8%)	231.445 (227.124–235.766)		3250 (67.9%)	1436.508 (1390.880–1482.136)	

*Mean survival in days **p value from Log-Rank (Mantel-Cox).
uHR, unadjusted Hazard Ratio; CI, confidence interval.

In the univariate analysis for the 1-year follow-up period, an unadjusted Hazard Ratio (uHR) of 1.022 [95% CI = (0.833–1.253)] was calculated for the homeless group. The mean survival time was 228.440 days [95% CI = (206.590–250.290)] for the homeless group; and 231.576 days [95% CI = (227.168–235.984)] for the resident group. These differences were not statistically significant on the test of equality of survival distributions (Log Rank *p* value = 0.836).

In the multivariate analysis for the 1-year follow-up period, an adjusted Hazard Ratio (aHR) of 1.015 [95% CI = (0.827–1.245)] was calculated for the homeless factor. In this model, statistical significance was not achieved, with a *p*-value of 0.890. As for other categorical variables present in the Cox regression, differences in sex and some diagnostic categories were statistically significant.

4. Discussion

It is well-established that, in the short term, the homeless population is more likely to be readmitted to a psychiatric inpatient unit than resident, especially within 30 days from discharge (Laliberté et al., 2020; Mascayano et al., 2022). In our sample, we found a similar risk in comparison with those described in previous studies (although after the Bonferroni correction, the differences in the multivariate analysis were only marginally significant). This is important, as early readmission is a negative outcome from a clinical and public health perspective, and many efforts of clinicians and researchers have been put into developing interventions that reduce early readmission (Vigod et al., 2013, 2015). In a recent review, Owusu et al. (2022) list some of these interventions: residential treatment services, adequate and sufficient hospital care, establishing an adequate discharge plan (discharge services, follow-up calls, short-term case management, bridge visits, and psychoeducation), focusing on staff training and coordination of care and transition efforts, provide psychological support (including proper addressing of patients' perceived needs) and ensure medication adherence (Owusu et al., 2022).

Homelessness is a condition that confers on those who suffer it a significant personal vulnerability, having been described as part of a "fourth world" (Raps and Kemelman, 1994), or third

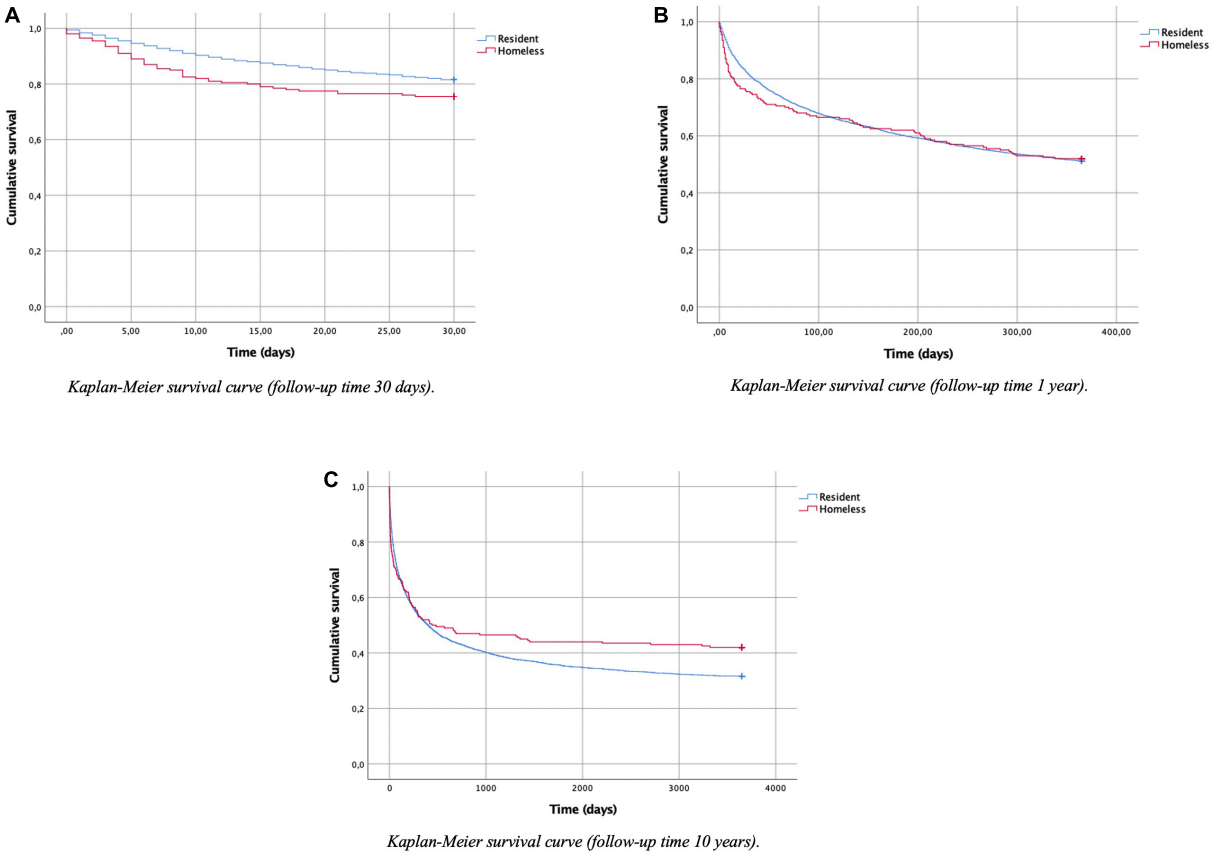

FIGURE 1
Kaplan-Meier survival analysis representation. **(A)** Kaplan-Meier survival curve (follow-up time 30 days). **(B)** Kaplan-Meier survival curve (follow-up time 1 year). **(C)** Kaplan-Meier survival curve (follow-up time 10 years).

TABLE 3 Multivariate cox regression summary.

		30 days		1 year		10 years	
		Exp(B) (95% CI)	*p* value	Exp(B) (95% CI)	*p* value	Exp(B) (95% CI)	*p* value
Age		0.985 (0.979–0.990)	0.000	0.991 (0.988–0.994)	0.000	0.989 (0.987–0.992)	0.000
Sex	Male	1.087 (0.942–1.255)	0.253	1.116 (1.020–1.222)	0.017	1.118 (1.036–1.206)	0.004
	Female (reference)	–	–	–	–	–	–
Length of stay		1.004 (1–1.008)	0.070	1.004 (1.001–1.006)	0.002	1.005 (1.003–1.007)	0.000
Diagnosis	Substance use disorders	0.608 (0.466–0.794)	0.000	0.744 (0.626–0.885)	0.001	0.794 (0.683–0.923)	0.003
	Bipolar disorders	0.826 (0.638–1.070)	0.148	0.900 (0.758–1.069)	0.230	1.073 (0.926–1.243)	0.347
	Psychotic disorders	0.518 (0.415–0.647)	0.000	0.808 (0.699–0.933)	0.004	0.940 (0.829–1.066)	0.336
	Personality disorders (reference)	–	–	–	–	–	–
	Other disorders	0.861 (0.696–1.065)	0.168	0.834 (0.719–0.967)	0.016	0.828 (0.727–0.943)	0.004
Homeless	Yes	1.387 (1.308–1.853)	0.027	1.015 (0.827–1.245)	0.890	0.826 (0.686–0.994)	0.043
	No (reference)	–	–	–	–	–	–

Exp (B) = adjusted Hazard Ratio. CI, confidence interval.

world within the first world. Homeless users have a high prevalence of both physical and mental illnesses (Fazel et al., 2008, 2014), as well as poor access to primary care services (Khandor et al., 2011) and ambulatory mental health services (Folsom et al., 2005). All of this makes them more likely to use acute care services (Chambers et al., 2013; Saab et al., 2016). This, added to the fact that shelters are not appropriate places to recover from an episode of mental illness requiring hospitalization (Forchuk et al., 2006), generates a "perfect storm" that would explain the high rates of early psychiatric readmission found in this population. This is also

supported by the fact that the lack of social support at discharge and the absence of availability of housing solutions are predictors of psychiatric readmission (Scanlan et al., 2017; de Jong et al., 2021). So, many of these homeless users may experience the "revolving door" phenomenon, which indicates repeated hospitalizations of the same patients, and which has become a public health problem (Doran et al., 2013; di Giovanni et al., 2020). Some authors have described homeless patients with mental illnesses as "super-difficult" patients, object of Marontology, an unborn medical specialty recently proposed (Gama Marques, 2021).

In our sample, we found a higher mean length of stay in the resident group than in the homeless group (12 vs. 10 days respectively). This is an unexpected finding since, in general, the literature states that homeless users on medical and surgical services remain hospitalized longer than housed users, resulting in substantial excess costs (Hwang et al., 2011). For us, a possible explanation is that in our city we have a municipal shelter with which we work in a coordinated manner and that generally accepts homeless patients when they leave the hospital, in a relatively fast time. Therefore, the problem would not be so much whether our homeless population has a place to live at hospital discharge, but whether or not this site is suitable for their health needs.

On the other hand, both in the homeless group and in the resident group, the most frequent diagnostic category was "psychotic disorders" (27.1 and 35.5% respectively). This is an expected fact since we are talking about a population that has been admitted to a psychiatric hospitalization unit. However, it is noteworthy that, while in the resident group the second most frequent diagnostic category is "other disorders" (30.8%), a large group that includes mental disorders with a better prognosis such as depressive or anxiety disorders, in the homeless group this place is occupied by the "substance use disorders" (19.6%) followed closely by "personality disorders" (19.1%). Considering that these disorders constitute common debilitating conditions which increase the risk of all-cause mortality (Smith and Cottler, 2020), our finding would support what has been referred to in previous studies on the high burden of disease in the homeless collective.

However, despite these findings, there are not many studies that analyze the psychiatric readmission risk in the homeless population in the long term. Our study analyzes the time to readmission in all episodes of hospitalization of homeless and resident psychiatric users, with a follow-up period of up to 10 years. And it does so from the perspective of a single inpatient unit. In this sense, we have found that, as the follow-up period increases, the greater risk of readmission of the homeless population decreases. Thus, this is equated in the analysis of survival to 1 year with the resident population and even could decrease at 10 years. Although we have to be prudent in the interpretation of these results (since some these differences were only nominally or marginally significant after the Bonferroni correction and the multivariate analysis), we think that it shows a tendency which can have several explanations.

So, for this phenomenon we hypothesize three possible causes: the mobility of the homeless population, their disengagement from mental health services, and the high mortality of this group.

The reality of homeless mobility is a controversial issue, with an older body of evidence suggesting high residential transience in this population (Bachrach, 1987; Pollio, 1997; Duchon et al., 1999), most questioned today (Parker and Dykema, 2013). It is possible that the differences found are due to a heterogenous definition of the concept of transience, the geographical area of study, and an improvement over time in the social resources available to the homeless population. In our case, Malaga is a city well-connected with many other nearby places and quasi-border with other countries such as Morocco, being a place of habitual passage of a significant proportion of the migrant population, many of them with very limited economic resources. Therefore, it is quite likely that the homeless population that habitually or temporarily resides in our city has a high level of instability residence. In any case, recent studies show that adults with residential transience had greater odds of mental illness than those without transience (Glasheen et al., 2019).

On the other hand, after psychiatric discharge, homeless users are less likely to have adequate medical follow-up (Burra et al., 2012), and they have difficulties in long-term engaging with services and having an adequate level of commitment to treatment (Dixon et al., 2016). Thus, while early psychiatric readmission can be a reliable indicator of unsatisfied needs at discharge; in the long term, the fact that a subject with a severe mental illness disappears from the medical records of a hospital could be indicating a complete abandonment of the use of mental health services, and an inability of these to detect this population at risk and care for it adequately.

Finally, we need to consider the high mortality rate of homeless users compared to the general population (Aldridge et al., 2018), which may have to do with various factors, such as increased disease burden or aging (Fazel et al., 2014). Since we have used only clinical records of admissions and discharges, in one psychiatric hospitalization unit, it is plausible that the differences found in the long term are due to higher mortality and mobility in this population.

5. Limitations

In this work we have tried to shed some light on the complex problems that homelessness represents for acute mental health services, and on its complex relationship with psychiatric admissions and readmissions. Although we consider that some interesting conclusions can be drawn from our results, as we relate in the following section, we cannot abstract from the limitations of our study. First, some results, once Bonferroni correction for multiple comparisons has been performed, reach only nominal or marginal statistical significance. This may be because we do not have a very large sample size. Secondly, although we have calculated for both univariate and multivariate analysis the size of the effect through the Hazard Ratio, the clinical relevance of the results could be discussed. Also, the fact of having focused only on the readmissions that have occurred during a specific period in a single hospital, means that we do not have all the information we would like about the future of these users in terms of mortality, geographical mobility, or admissions in different hospitalization units, having to make hypotheses about these aspects. Furthermore, no active follow-up of the patients was done. Finally, we do not have exact

information on the percentage of admissions in the homeless group that actually correspond to the migrant population, which would help us to contrast the hypothesis about their high mobility and disengagement with local mental health services. We don't know either the percentage of anonymous patients, which would allow us to compare with recent studies about the John Doe syndrome (Gama Marques and Bento, 2020).

6. Conclusion

Homelessness remains a major social problem with significant clinical and public health implications. Our study shows in line with other previous studies that the risk of early readmission in the homeless population is higher than in the resident population, which may be due to the greater psychic and somatic morbidity existing in this group at risk and the inexistence of appropriate resources for recovery to discharge.

However, when we analyze the behavior of the homeless population in the long term, these differences begin to blur, and the risk of long-term readmission to the same hospital tends to be lower than in the resident population, even when adjusted for potential confounding variables in the multivariate analysis. A possible limitation of our study is that we are only looking at what happened in only one hospitalization unit. However, interesting conclusions can also be drawn from this. We hypothesize, which should be confirmed in subsequent studies, that these differences could be justified by the high mobility of the homeless population of our city, its low degree of linkage with long-term mental health services, and the high mortality rate of this population group.

Finally, we believe that these should have a direct impact on health management and planning. On the one hand, to develop time-critical intervention programs in the short term to avoid the high rate of early readmission of the homeless population. On the other hand, to be able to link the homeless population in the long term and avoid its dispersion and abandonment as well as the generation of unsatisfied health needs.

Data availability statement

The data analyzed in this study is subject to the following licenses/restrictions: The dataset could be available under reasonable request. Requests to access these datasets should be directed to JG-P, jose.guzman.parra.sspa@juntadeandalucia.es.

Ethics statement

The studies involving human participants were reviewed and approved by Comité de Ética de la Investigación Provincial de Málaga. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

Author contributions

JH-I and JG-P participated in the conception, design, data analysis, and wrote the manuscript. AB-A and BM-K contributed to the conception and design of the study and its review. FM-C the senior author was active in the conception, design, and writing and edition of the manuscript. All authors approved the final version of the manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

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Problemas ligados ao álcool em centros de emergência (PLACE)—People experiencing homelessness with alcohol-related problems in Lisbon's emergency shelters during the COVID-19 pandemic: a description and analysis of a harm reduction intervention

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Introduction: Alcohol-related problems disproportionally affect people experiencing homelessness. As the first wave of the COVID-2019 pandemic spread in 2020, a number of emergency shelters were opened in Lisbon. Increased difficulties in obtaining alcohol could have led to an increased incidence of alcohol withdrawal. Therefore, a low-threshold harm reduction intervention was introduced to these emergency shelters. This consisted of a fixed medication treatment, made available immediately for those with specific conditions, without the need for a medical evaluation or abstinence from alcohol, together with an offer of subsequent access to specialized addiction centers. The *Problemas Ligados ao Álcool em Centros de Emergência* (PLACE) study (alcohol-related problems in emergency shelters) is a retrospective mixed-methods observational study. It describes the demographic, health, and social characteristics of shelter users participating in the program and aims to evaluate the intervention as well as the experience of the patients, professionals, and decision-makers involved.

Results: A total of 69 people using shelters self-reported alcohol-related problems. Among them, 36.2% of the people accepted a pharmacological intervention, and 23.2% selected an addiction appointment. The take-up of the intervention was associated with better housing outcomes. A description of an individual's trajectory after leaving the shelter is provided.

Discussion: This study suggests that non-abstinence-focused interventions can be useful and well-tolerated in treating addiction in this population.

KEYWORDS

homeless, alcohol, shelter, harm-reduction, COVID, pandemic, low-threshold, alcohol withdrawal syndrome

1. Introduction

Portugal is among the countries with the highest alcoholic drink consumption rates. According to the 2018 World Health Organization European Health Report, the alcohol-use disorder rate was 6.8% and alcohol dependency was 3% (World Health Organization, 2018; Teixeira, 2022). The updated version in 2021 stated that Portuguese adults tend to drink approximately 12.1 liters per year (which increased by 1.6% compared with 2015), which is higher than the average of most European countries, which is 9.5 liters per year (World Health Organization, 2022).

Alcohol-use disorder (AUD) is over-represented in people experiencing homelessness (PEH) (8.1–58.5%), although it may be underdiagnosed and undertreated (National Health Care for the Homeless Council, 2003; Fazel et al., 2008).

At the end of 2019, Lisbon was reported as having 1.071 people experiencing rooflessness and 2.883 experiencing houselessness (Grupo de Trabalho para a Monitorização e Avaliação da ENIPSSA, 2020).

In a study assessing homeless people having contact with a Lisbon psychiatric hospital from 2016 to 2019, the most common psychiatric diagnosis was drug abuse (34%), followed by alcohol abuse (33%), and numbers ranging from 41% to 77% reported in street evaluations in 1996 (Bento et al., 1996; Fernandes et al., 2022).

PEH have six to 10 times higher risk of alcohol-related death than the general population. These include not only medical complications linked to alcohol long-term abuse but also alcohol withdrawal syndrome (Hwang et al., 2009; Baggett et al., 2015).

Alcohol withdrawal syndrome (AWS) is a potentially fatal condition, occurring after sudden cessation or significant reduction in heavy and prolonged alcohol use. AWS symptoms include autonomic hyperactivity, nausea, vomiting, headache, tremors, anxiety, psychomotor agitation, and, in more severe cases, hallucinations, occupational delirium, delirium tremens, seizures, and death. It can cause irreversible neurological comorbidities, such as Wernicke–Korsakoff syndrome, which includes acute onset of Wernicke's encephalopathy (confusion, oculomotor disturbances, and ataxia), which, if untreated, can progress to or coexist with Korsakoff syndrome characterized by anterograde and retrograde memory deficits, limited learning ability, and impaired executive function (Popa et al., 2021). Additionally, Marchiafava–Bignami syndrome, a highly rare but rather severe condition characterized by demyelination and necrosis of the corpus callosum causing dementia, altered mental status, spasticity, dysarthria, ataxia, gait abnormalities, and seizures can also occur in malnourished chronic alcohol users, presumably due to combination of alcohol-induced neurotoxicity (with an uncertain nature) and deficiency of the B-complex vitamins (Singh and Wagh, 2022).

Alcohol use-related harm to PEH is aggravated by co-occurring social vulnerability, precarious health conditions, and difficulty in accessing care (Bloomfield et al., 2006; Collins et al., 2016; Stafford and Wood, 2017). Withdrawal symptoms can be a factor for a PEH to leave a welcoming center (Pauly et al., 2019). This reinforces the exclusion cycle that separates PEH from appropriate medical and social care.

During the COVID-19 pandemic, these challenges were magnified as already poor health and precarious living conditions were aggravated by reduced income, barriers to healthcare and support services, and increased vulnerability to the virus (Onyango et al., 2020).

Under the umbrella of harm reduction, safe supply prescribing and managed alcohol programs were reported as ways to mitigate potentially severe illness in emergency shelters, reduce hospital visits, and improve substance use disorder, sometimes called "risk mitigation" or "pandemic prescribing" (Bonn et al., 2020; Chang et al., 2020; Tyndall, 2020; British Columbia Centre on Substance Use (BCCSU), 2022; Brothers et al., 2022; Glegg et al., 2022).

Harm reduction interventions do not require abstinence. For alcohol, this includes a set of pragmatic strategies that minimize alcohol-related damage for the affected individual and society at large (Marlatt et al., 1998; Denning and Little, 2000).

Managed alcohol programs provide eligible individuals with regular doses of alcohol and can enhance housing stability, reduce alcohol-related harms, improve safety, and create opportunities for reconnection with families, communities, and treatment. Combined pharmacological and behavioral harm reduction regimes result in higher adherence in PEH and are effective in reducing alcohol use and associated risks as well as enhancing health and quality of life (Collins et al., 2021; Kouimtsidis et al., 2021).

Before 2020, Lisbon had no low-threshold alcohol interventions nor managed alcohol programs.

There was a considerably increased risk of AWS due to sudden reduction or suspension of alcohol consumption (due to reduced income and the closure of alcohol retailers) (Narasimha et al., 2020; Onyango et al., 2020; Rehm et al., 2020).

To prevent severe AWS, a low-threshold harm reduction intervention provided without a prior medical evaluation was made available to people experiencing homelessness during their stay at emergency shelters (ESs).

This article describes PEH with self-reported alcohol-related problems admitted to the ES from March to December 2020 and describes their participation in the harm reduction intervention. It

identifies distinguishing features between those who accepted and those who rejected the intervention procedure.

2. Materials and methods

This is a retrospective observational cross-sectional study included in the Problemas Ligados ao Álcool em Centros de Emergência (PLACE) (alcohol-related problems in emergency shelters) research project. This article was written according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement (von Elm et al., 2008).

2.1. Intervention development

The municipality of Lisbon developed four ESs, mostly adapted sports facilities, destined for PEH: *Complexo Desportivo Municipal do Casal Vistoso* (a multi-use sports structure) with a capacity for 100 individuals, *Clube Nacional de Natação* (National Swimming Club) for 48, *Pavilhão do Atlético Clube de Portugal* (a multi-use sports structure for *Atlético Clube de Portugal*) for 40, and *Casa do Lago* (a shelter created in 2020 for this purpose) for 18 (exclusive for cis and trans women) (Office of the High Commissioner for Human Rights; Fuertes et al., 2021).

These shelters provided the following:

- COVID-19 symptom triage, with daily symptom checks and temperature measurements
- Organized healthcare and social support, with a nurse on site daily and access to a physician
- In-shelter medication management
- Free meals and clothing as well as beds and showers
- Direct access to social workers and social programs
- Support for attending medical or social appointments.

While at the ES, users also had access to screenings for tuberculosis, viral hepatitis both type B and type C, syphilis, and human immunodeficiency virus (HIV), with referral and treatment when appropriate as well as access to methadone substitution programs. Different partnerships provided support with search and training for employment, documentation, language courses, and juristic support.

Substance use was not allowed inside the ES. A mobile drug consumption room was placed in front of two shelters for the use of injected substances under the supervision of health professionals. Violence, robbery, or the use of drugs and alcohol were not allowed inside the ES and were reasons for expulsion.

A low-threshold pharmacological intervention was implemented in order to reduce the incidence of severe alcohol withdrawal syndrome during the pandemic, based on a collaborative study among *Divisão de Intervenção nos Comportamentos Aditivos e Dependências* (Division for Intervention in Addictive Behaviors and Dependencies) and *Unidade de Alcoologia de Lisboa (*Alcohol Treatment Unit of Lisbon)(UAL), a center dedicated to the treatment of alcohol-related problems (ARP); the organic unit of regional health administration of Lisbon's pharmacy, the Lisbon Municipality, and the non-governmental organization *Associação Ares do Pinhal* was responsible for the clinical and social management of PEH admitted in the new ES.

The Portuguese *Serviço de Intervenção nos Comportamentos Aditivos e nas Dependências* (SICAD) (General-Directorate for Intervention on Addictive Behaviors and Dependencies) recommended that this intervention should be adopted by all ESs during the pandemic (Neto et al., 2020).

On arrival at the ES, all users were formally asked about their alcohol intake, daily use ("do you drink every day?"), and possible withdrawal symptoms ("when you don't drink, do you experience tremors, vomiting, seizures, or epilepsy?"). Clinical staff (psychologists and nurses) contributed informally to the evaluation, observing withdrawal symptoms and physical signs suggesting problematic use. No structured evaluation for alcohol-use disorder diagnosis was used as the protocol was designed to be delivered in a low-threshold principle. Those who self-reported having problematic alcohol use, informally and by answering "yes" to either question were offered a pharmacological intervention and a specialized alcohol-use appointment (at UAL or other specialized structures).

This offer was independent of any medical evaluation and did not require a prescription.

Those who accepted being engaged in the low-threshold pharmacological intervention received a fixed dose of diazepam 10 mg twice a day, tiapride 100 mg, thiamine (B1) 100 mg, pyridoxine (B6) 200 mg, folic acid (B9) 5 mg, and cobalamine (B12) 0.2 mg supplementation (Neto et al., 2020). This regular administration of medication incorporated a brief nursing intervention targeting alcohol harm reduction. This included psychological support, active listening, information about alcohol and substance use, coping strategies, participation in occupational activities, and psychosocial support.

A specialized alcohol-use medical appointment was also offered—the pharmacological intervention was delivered whether or not the individual accepted the medical appointment. The appointment took place in the ES or at UAL or at another specialized site, where users were evaluated by outreach teams that collaborated with the ES or the UAL team. Following the medical evaluation, the prescription was sometimes changed and individually tailored accordingly (e.g., some users underwent alcohol detox in the ES prior to being admitted to therapeutic communities).

The time of residence in the ES varied, but this intervention was promoted for the whole duration of residence, until drop-out, prescription of other medication, or leaving the ES.

2.2. Population and sample

The studied population is composed of all PEH with alcohol-related problems (ARP) that were admitted to Lisbon's Emergency Shelters from March to December 2020.

Of the 700 people housed in the ES in this time frame, 402 underwent a formal psychosocial assessment required for permanence in the shelter, and among them, 69 self-reported as having alcohol-related problems and were included in the sample.

2.3. Data collection

Data for the formal psychosocial assessment at admission were collected through a structured interview and included information about demographic characteristics, health and social care, and drug use. Data on the individual path/course followed within the ES was regularly registered until exitance.

The PLACE project was designed following protocol implementation and database development and was approved by the Regional Health Administration Ethical Commission (036/CES/INV/2021) (CES- *Conselho de Ética para a Saúde*—Council for Ethics in Health, INV- Investigation*)*. Anonymity and confidentiality of data were guaranteed.

2.4. Variables and statistical analysis

The variables under analysis regarded sociodemographic characteristics (gender, age group, marital status, education level, and country of origin), social dimensions (time homeless, family relations, social support, documentation, and ongoing judicial issues), substance use (consumption of various substances, alcohol withdrawal symptoms, overdose history, previously specialized follow-up, and risk behaviors), health status and healthcare (diagnosed physical and mental illnesses, hospital and primary care follow-up), and trajectory when leaving the shelter. Adherence to the pharmacological intervention and to the medical appointment was also reported. Other than pharmacological and alcohol-use appointment adherence data, all variables were self-reported.

The two primary outcomes were the proportion of acceptance of pharmacological intervention and the proportion of acceptance of the alcohol-use medical appointment. The secondary outcome was assessing the relationship between intervention acceptance and other variables, trying to find a pattern of acceptance moderators and facilitators.

Since all the variables under analysis were either nominal or ordinal, the descriptive analysis of the variables was carried out using absolute and relative frequencies. Continuous variables were converted to ordinal ones by grouping their values.

Pearson's chi-squared test and Fisher's exact test were applied to compare the variables under investigation between the group that adhered to pharmacological intervention and the group that did not and also between the group that adhered to the medical appointment and the group that did not.

Statistical tests were conducted at the significance level of 0.05, and a p-value between 0.05 and 0.1 was regarded as suggestive.

2.5. Confounding variables

The retrospective study design with a preexisting work database impairs controlling confounding variables at the design stage and the small n of this sample prevents us from doing any large-scale statistical work to minimize and elucidate their effects. We tested associations between our outcomes and all studied variables in an attempt to explore possible predictors although their meaning cannot be cleared without a logistic regression analysis which would need a considerably higher number of subjects (Hosmer et al., 2013).

However, our sample is particularly representative of the population being studied as it represents a real-world emergency scenario intervention, and outcomes and study objectives were chosen in an attempt to increase validity. Data are thus presented with this caveat which will be further approached below.

3. Results

Participant characteristics are presented in Table 1. Overall, 87.0% were male subjects, and 73.5% were over 40 years old. Approximately two-thirds were single (67.6%), and 22.1% were divorced. About a quarter had completed high school (12 years of education: 27.3%) and 21.2% completed 9 years (minimum mandatory schooling level), while 45.4% completed lower years of education. The majority of the participants were born in Portugal (63.9%); foreign-born participants were mostly from African countries (Angola, Cape Verde, the Gambia, Malawi, and Mozambique), and a minority were from Europe (Belgium, Moldavia, Poland, Russia, and Ukraine), South America (Brazil), and Asia (Nepal).

More than half of the participants (58.5%) had been in a homeless situation for up to 2 years, and 41.5% for a longer period. Only 39.1% of participants reported maintaining their family relationships. The majority (62.7%) reported receiving some sort of social support (e.g., money and medication dispensing). Approximately 30% were missing some sort of documentation, either through loss (Portuguese citizens) or through bureaucratic hold-ups or lack of resources to start documentation processes (migrants), and 13% reported ongoing judicial issues, such as legal processes.

Participants were asked about health-related information (Table 2). Overall, 31.9% reported using some sort of substance recreationally other than alcohol. Among those who used substances, cannabis was the most frequently reported (50%, $n = 11$), followed by cocaine (36.4%, $n = 8$), non-prescribed sedatives (31.8%, $n = 7$), and opioids (22.7%, $n = 5$); 35% reported using more than one substance. Of the total samples, 46.4% had a history of alcohol-related withdrawal symptoms and 30.9% of overdose (of the latter, 16.1% were no longer using substances). Over half (55.1%) had previous specialized treatment achieving some period of abstinence (such as admission for detoxification or therapeutic communities). More than a third (35.4%) reported risk-taking behaviors at some point in their life (e.g., sharing needles or other materials and unprotected sex).

The majority of the participants (61.2%) reported having a diagnosed physical illness (mostly non-communicable diseases such as heart disease, liver disease, diabetes, and high blood pressure), and 21.7% reported a diagnosed psychiatric disease (e.g., depression and schizophrenia). Overall, 63.8% of the participants reported being followed in a healthcare unit (non-substance use related), mostly hospital care (53.6%) and primary care (33.3%).

The participants who adhered to the pharmacological intervention did not differ significantly from those who declined it in terms of sociodemographic characteristics, social dimensions of substance use, and healthcare, except regarding health status

TABLE 1 Characteristics of the participants.

		n (%)
Sociodemographics		
Gender ($N = 69$)	Female	9 (13.0)
	Male	60 (87.0)
	Transgender persons	0 (0.0)
Age group ($N = 68$)	27–30	3 (4.4)
	31–40	15 (22.1)
	41–50	26 (38.2)
	51–60	20 (29.4)
	61–67	4 (5.9)
Marital status ($N = 68$)	Single	46 (67.6)
	Marriage	5 (7.4)
	Divorced	15 (22.1)
	Widowed	2 (2.9)
Education ($N = 66$)	4 Years	15 (22.7)
	6 Years	15 (22.7)
	9 Years	14 (21.2)
	High school	18 (27.3)
	University	4 (6.1)
Country of origin ($N = 61$)	Portugal	39 (63.9)
	Africa	12 (19.7)
	Europe	5 (8.2)
	Latin America	3 (4.9)
	Asia	2 (3.3)
Social dimensions		
Time homeless ($N = 65$)	1–6 months	15 (23.1)
	6–12 months	8 (12.3)
	12–24 months	15 (23.1)
	>24 months	27 (41.5)
Maintained family relationships ($N = 69$)	Yes	27 (39.1)
	No	42 (60.9)
Social support ($N = 67$)	Yes	42 (62.7)
	No	25 (37.3)
Documentation ($N = 69$)	Yes	48 (69.6)
	No	21 (30.4)
Ongoing judicial issues ($N = 69$)	Yes	9 (13)
	No	60 (87)

TABLE 2 Reported substance use, health status, and health care.

		n (%)
Substance use		
Use of substance other than alcohol ($n = 69$)	Yes	22 (31.9)
	No	47 (68.1)
Among those that answer Yes		
Cannabis ($n = 22$)	Yes	11(50)
	No	11(50)
Sedatives ($n = 22$)	Yes	7(31.8)
	No	15(68.2)
Opioids ($n = 22$)	Yes	5(22.7)
	No	17(77.3)
Cocaine ($n = 22$)	Yes	8(36.4)
	No	14(63.6)
Multiple drugs ($n = 20$)	Yes	7(35)
	No	13(65)
Alcohol withdrawal symptoms ($n = 69$)	Yes	32 (46.4)
	No	37 (53.6)
Overdose history ($n = 68$)	Yes	21 (30.9)
	No	47 (69.1)
Previous follow-up at CAD ($n = 69$)	Yes	30 (43.5)
	No	39 (56.5)
Risk behaviors ($n = 69$)	Yes	23 (35.4)
	No	42 (64.6)
Health status and health care		
Diagnosed physical illnesses ($n = 67$)	Yes	41 (61.2)
	No	26 (38.8)
Diagnosed mental illnesses ($n = 65$)	Yes	15 (23.1)
	No	50 (76.9)
Hospital follow-up ($n = 69$)	Yes	37 (53.6)
	No	32 (46.4)
Primary Care follow-up ($n = 69$)	Yes	23 (33.3)
	No	46 (66.7)

(Table 3). A higher proportion of participants who adhered to the pharmacological intervention reported having a history of alcohol-related withdrawal symptoms (60 vs. 38.6% of those who declined; $p < 0.10$).

Overall, 23.2% of the participants ($n = 16$) adhered to the alcohol-use medical appointment, and 76.8% did not attend it ($n = 53$) (Table 4). A higher proportion of participants who adhered to the medical appointment reported having maintained their family relationships (62.5 vs. 32.1% of those who did not attend, $p < 0.05$), and a lower proportion reported having a diagnosed mental illness (6.4 vs. 28.6% of those who did not attend the appointment, $p < 0.1$).

TABLE 3 Factors associated with adherence to the pharmacological intervention.

		Adherence to the pharmacological intervention				*P value*
		Yes *n* (%)		No *n* (%)		
Total		25	(36.2)	44	(63.8)	
Sociodemographics						
Gender	Female	3	(12.0)	6	(13.6)	*>0.999*[a]
	Male	22	(88.0)	38	(86.4)	
Age group	21–30	0	(0.0)	3	(7.0)	*0.387*[a]
	31–40	7	(28.0)	8	(18.6)	
	41–50	10	(40.0)	16	(37.2)	
	51–60	8	(32.0)	12	(27.9)	
	61 and above	0	(0.0)	4	(9.3)	
Marital status	Single	17	(68.0)	29	(67.4)	*0.575*[a]
	Marriage	1	(4.0)	4	(9.3)	
	Divorced	7	(28.0)	8	(18.6)	
	Widowed	0	(0.0)	2	(4.7)	
Education	4 Years	5	(20.8)	10	(23.8)	*0.531*[b]
	6 Years	6	(25.0)	9	(21.4)	
	9 Years	4	(16.7)	10	(23.8)	
	High School	6	(25.0)	12	(28.6)	
	University	3	(12.5)	1	(2.4)	
Country of origin	Portugal	14	(63.6)	25	(64.1)	*0.987*[a]
	Africa	5	(22.7)	7	(17.9)	
	Europe	1	(4.5)	4	(10.3)	
	Latin America	1	(4.5)	2	(5.1)	
	Asia	1	(4.5)	1	(2.6)	
Social dimensions						
Time homeless	1–6 months	5	(20.0)	10	(25.0)	*0.993*[a]
	6–12 months	3	(12.0)	5	(12.5)	
	12–24 months	6	(24.0)	9	(22.5)	
	3–5 years	0	(0.0)	1	(2.5)	
	5–10 years	11	(44.0)	14	(35.0)	
	Over 20 years	0	(0.0)	1	(2.5)	
Family relationships	Yes	10	(40.0)	17	(38.6)	*0.911*[b]
	No	15	(60.0)	27	(61.4)	
Social Support	Yes	16	(66.7)	26	(60.5)	*0.615*[b]
	No	8	(33.3)	17	(39.5)	
Ongoing judicial issues	Yes	1	(4.0)	8	(18.2)	*0.141*[a]
	No	24	(96.0)	36	(81.8)	
Documentation	Yes	20	(80.0)	28	(63.6)	*0.156*[b]
	No	5	(20.0)	16	(36.4)	
Substance use						
Use of substance other than alcohol	Yes	7	(28.0)	15	(34.1)	*0.602*[b]

(Continued)

TABLE 3 (Continued)

		Adherence to the pharmacological intervention				*P value*
		Yes *n* (%)		No *n* (%)		
	No	18	(72.0)	29	(65.9)	
Overdose history	Yes	6	(24.0)	15	(34.9)	*0.349*[b]
	No	19	(76.0)	28	(65.1)	
Previous follow-up at center for addiction disorders	Yes	9	(36.0)	21	(47.7)	*0.345*[b]
	No	16	(64.0)	23	(52.3)	
Risk behaviors	Yes	8	(32.0)	15	(37.5)	*0.652*[b]
	No	17	(68.0)	25	(62.5)	
Alcohol withdrawal symptoms	Yes	15	(60.0)	17	(38.6)	*0.087**[b]
	No	10	(40.0)	27	(61.4)	
Health care						
Diagnosed physical illnesses	Yes	15	(60.0)	26	(61.9)	*0.877*[b]
	No	10	(40.0)	16	(38.1)	
Diagnosed mental illnesses	Yes	4	(16.0)	11	(27.5)	*0.284*[b]
	No	21	(84.0)	29	(72.5)	
Hospital follow-up	Yes	13	(52.0)	24	(54.5)	*0.839*[b]
	No	12	(48.0)	20	(45.5)	
Primary Care follow-up	Yes	8	(32.0)	15	(34.1)	*0.859*[b]
	No	17	(68.0)	29	(65.9)	
Adherence to alcohol-use medical appointment	Yes	14	(56.0)	2	(4.5)	*<0.001****[b]
	No	11	(44.0)	42	(95.5)	

[a]Fisher's exact test.
[b]Chi-square test.
Statistically significant differences at the *0.1, **0.05, ***<0.001 significance level.

Adherence to the pharmacological intervention was significantly associated with adherence to the alcohol-use medical appointment ($p < 0.001$).

Of the 14 participants who adhered to both pharmacological intervention and medical appointment: 11 were male subjects, 10 were ≥40 years old, 9 had ≥9 years of education, 8 were born in Portugal, 10 were in a homeless situation for over 1 year, and four reported using some sort of substance recreationally other than alcohol (data not shown in Table).

Of the 42 participants, those who declined both the pharmacological intervention and the medical appointment were of the following characteristics: 37 (88.1%) were male subjects, 15 (35.7%) were 41–50 years old, 11 (26.2%) were 51–60 years old, 12 (28.6%) had high school education, 27 (64.2%) had up to 9 years, 23 (53.8%) were born in Portugal, seven (16.7%) were born in an African country, 15 (35.8%) were in a situation of homelessness for over 2 years, 10 (23.8%) were in a situation of homelessness for <6 months, and 14 (33.3%) reported using some sort of substance recreationally other than alcohol (data not shown in Table).

Overall, 29.9% of the participants ($n = 20$) left the shelter for some sort of housing solution, and 41.8% ($n = 28$) were integrated into institutions (e.g., a shelter or a drug rehabilitation structure). The remaining 28.4% had a negative outcome–4.5% abandoned the shelter, 19.4% were expelled (reasons included using drugs in the ES, violence, or stealing) and 4.5% ($n = 3$) left due to other reasons (e.g., hospital admission, arrest, or deportation).

Of the participants who accepted the pharmacological intervention, 43.5% went on to a housing facility and 43.5% to an institution, while 13% had a negative outcome leaving the shelter. Among those who declined the pharmacological intervention, over a third (36.4%) had negative outcomes, while 40.9% went on to an institution and a minority (22.7%) followed a housing option ($p < 0.1$).

Among the participants who accepted the medical appointment, 56.3% left the shelter for a housing solution and only 6.3% had a negative trajectory outcome. Among those who refused the appointment, only 21.6% went on to a housing solution, while 43.1% were integrated into an institution and 35.3% had negative outcomes ($p < 0.05$).

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TABLE 4 Factors associated with adherence to the alcohol-use medical appointment.

Adherence to the alcohol-use medical appointment						*P value*
		Yes *n* (%)		No *n* (%)		
Total		16	(23.2)	53	(76.8)	
Sociodemographics						
Gender	Female	4	(25.0)	5	(9.4)	*0.197*(1)
	Male	12	(75.0)	48	(90.6)	
Age group	21–30		—	3	(5.8)	*0.892*(1)
	31–40	4	(25.0)	11	(21.2)	
	41–50	7	(43.8)	19	(36.5)	
	51–60	5	(31.3)	15	(28.8)	
	61 and above		—	4	(7.7)	
Marital status	Single	11	(68.8)	35	(67.3)	*>0.999*(1)
	Marriage	1	(6.3)	4	(7.7)	
	Divorced	4	(25.0)	11	(21.2)	
	Widowed	0	—	2	(3.8)	
Education	4 Years	4	(25.0)	11	(23.8)	*0.603*(2)
	6 Years	2	(12.5)	13	(21.4)	
	9 Years	4	(25.0)	10	(23.8)	
	High School	4	(25.0)	14	(28.6)	
	University	2	(12.5)	2	(2.4)	
Country of origin	Portugal	10	(71.4)	29	(61.7)	*0.572*(1)
	Africa	3	(21.4)	9	(19.1)	
	Europe		—	5	(10.6)	
	Latin America		—	3	(6.4)	
	Asia	1	(7.1)	1	(2.1)	
Social dimensions						
Time homeless	1–6 months	3	(18.8)	12	(24.5)	*0.986*(1)
	6–12 months	2	(12.5)	6	(12.2)	
	12–24 months	4	(25.0)	11	(22.4)	
	3–5 years		1	(2.0)		
	5–10 years	7	(43.8)	18	(36.7)	
	over 20 years	—	1	(2.0)		
Family relationships	Yes	10	(62.5)	17	(32.1)	*0.029***(2)
	No	6	(37.5)	36	(67.9)	
Social support	Yes	11	(68.8)	31	(60.8)	*0.565*(2)
	No	5	(31.3)	20	(39.2)	
Ongoing judicial issues	Yes	1	(6.3)	8	(15.1)	(1)
	No	15	(93.7)	45	(84.9)	*0.674*
Documentation	Yes	13	(81.3)	35	(66.0)	*0.356*(2)
	No	3	(18.7)	18	(34.0)	

(Continued)

TABLE 4 (Continued)

Adherence to the alcohol-use medical appointment						*P value*
		Yes n (%)		No n (%)		
Substance use						
Use of substance other than alcohol	Yes	5	(31.3)	17	(32.1)	*0.950*[(2)]
	No	11	(68.7)	36	(67.9)	
Overdose history	Yes	2	(12.5)	19	(36.5)	*0.120*[(2)]
	No	14	(87.5)	33	(63.5)	
Previous follow-up at CAD	Yes	6	(37.5)	24	(45.3)	*0.582*[(2)]
	No	10	(62.5)	29	(54.7)	
Risk behaviors	Yes	6	(37.5)	17	(34.7)	*0.838*[(2)]
	No	10	(62.5)	32	(65.3)	
Alcohol withdrawal symptoms	Yes	8	(50.0)	24	(45.3)	*0.740*[(2)]
	No	8	(50.0)	29	(54.7)	
Health care						
Diagnosed physical illnesses	Yes	10	(62.5)	31	(60.8)	*0.902*[(2)]
	No	6	(37.5)	20	(39.2)	
Diagnosed mental illnesses	Yes	1	(6.3)	14	(28.6)	*0.091**[(2)]
	No	15	(93.7)	35	(71.4)	
Hospital follow-up	Yes	9	(56.3)	28	(52.8)	*0.810*[(2)]
	No	7	(43.7)	25	(47.2)	
Primary Care follow-up	Yes	7	(43.7)	16	(30.2)	*0.313*[(2)]
	No	9	(56.3)	37	(69.8)	

[(1)] Fisher's exact test.
[(2)] Chi-square test.
Statistically significant differences at the *0.1, **0.05, ***<0.001 significance level.

4. Discussion

Our sample of 69 individuals constituted 17.1% of those admitted to emergency shelters with self-reported alcohol-related problems. This is much lower than the rates of 38–70% of alcohol-use disorder prevalence in homeless people that are found through formal screening instruments in foreign series and lower than the 33% to 41% in Portuguese series (Bento et al., 1996; Canadian National Health Care for the Homeless Council, 2003; Fazel et al., 2008; Fernandes et al., 2022). There are considerable challenges to self-recognizing alcohol-related problems in the general population as well as in people in a homeless situation due to potential or imagined consequences of reported consumption, social desirability, poor episodic memory, or other cognitive impairments, etc., (Grüner Nielsen et al., 2021).

One possible contributory factor is that individuals wanting to be admitted to a shelter might choose to omit information about their drinking because of a fear that this would lead them to be denied admission. Of course, drug and alcohol use were not allowed inside the shelter, but substance use was allowed outside. The sample includes only those who self-identified as having problematic alcohol use by answering the triage questions. This is consistent with a harm reduction model where patients' values and goals are prioritized, although, at the same time, it is likely to underestimate the real prevalence of alcohol-use problems. The introduction of formal screening tools can improve accuracy but would need to be modified to be consistent with harm reduction principles.

Overall, 36.2% of the identified drinkers adhered to the pharmacological intervention. In this group, there was a significant specialized medical appointment adherence of 56% among those who accepted intervention, and 23.2% of the identified sample attended an appointment. In total, two patients who refused the pharmacological intervention accepted and attended an appointment.

Outcomes may be deemed as suggestive of an association (p-value < 0.1) between alcohol withdrawal symptoms and pharmacological intervention acceptance, which was expected. Interestingly, maintaining family relationships was associated with adhering to a specialized appointment. This might reflect a higher social functioning of those who would engage in treatment or it may highlight the family's role in supporting alcohol-use treatment (Atadokht et al., 2015).

A significant association was found between adherence to a medical consultation in a specialist treatment unit and better housing outcomes at the end of 2020 (p-value < 0.05). The findings also pointed to a possible association between accepting the pharmacological intervention and a better housing trajectory, but this can only be regarded as suggestive (p-value < 0.1). Although we have a small sample and this is a particular crisis environment, it replicates other authors' findings that harm reduction interventions can contribute to better housing outcomes (Stockwell et al., 2013; Bonn et al., 2020; Brocious et al., 2021).

No other significant differences were found between accepters and non-accepters which is surprising as we would think those with favorable healthcare experiences or social support as well as those struggling to access healthcare services, would be more receptive to interventions. We hope that studying qualitative data will help to clarify this subject.

It should be noted that 40% of PEH with self-reported ARP were experiencing homelessness for more than 3 years in this sample. Interestingly, this was not associated with worse intervention acceptance nor with worse appointment adherence. This suggests that treatment efforts can be accepted even by those who have been experiencing homelessness for longer periods, particularly where emergency shelters provide a new setting and opportunity for care. Previous contact with health services did not seem to affect acceptance of harm reduction interventions.

Regarding social data, 38.3% of interviewees had been homeless for <1 year, the same as 2018 national reports that placed this figure at 38.5%. From December 2019 to December 2020, the number of people experiencing houselessness increased by 27%, and the number of people experiencing rooflessness by only 5%. This may reflect positive policy implements with new structures such as emergency shelters stopping time spent roofless from increasing during the social upheaval of the pandemic (Grupo de Trabalho para a Monitorização e Avaliação da ENIPSSA, 2020, 2021; De Diário, 2022).

Overall, 26% of the sample were not Portuguese citizens, with 44.4% of non-Portuguese citizens in a homeless situation for <6 months (against 13.7% of patients with Portuguese citizenship) and 50% for <1 year against 27.4% seen in Portuguese citizens, which is a probable reflection of the pandemics impact on migration challenges and housing crisis, affecting more disproportionally those with more precarious jobs and less social support. Although without statistical evidence, the majority of migrants from Asia and Africa, who self-reported having an ARP, against Portugal-born citizens, adhered to this intervention, which can represent a low-threshold intervention role in bridging medical services in a well-known access gap (Lemmens et al., 2017). Further qualitative data can help to explore these findings.

Our sample included nine women who self-reported having an ARP. The previous experience of women's vulnerability in mixed shelters suggested a need for specific gender interventions. Therefore, a special emphasis was made to admit all women in need, including couples and trans-women (none self-reported as being transgender persons in our sample). Considering the lower prevalence of ARP in women in general, this number may also reflect gender stigma and a more hidden consumption pattern although this is speculative (Braud and Loison-Leruste, 2022).

Limitations to this study include a lack of formal diagnosis or standardized alcoholism classifications as well as a broad definition of homelessness (we could not specify between roofless, houseless, or insecure housing situations although we admit most of our sample to be roofless until shelter).

Research into care for homeless people can be challenging. There are difficulties in maintaining a constant follow-up (due to lack of a fixed address or easy-to-reach contact), often mistrust against carers or interventions, extreme power imbalances between researchers and research subjects, rapidly changing situations, stigma from the medical community, and multiple comorbidities.

Purely quantitative studies may provide a clouded picture, withholding context, perceptions, and motivations which motivated a mixed-methods approach with qualitative data following soon.

5. Conclusion

The 2020 COVID-19 pandemic destabilized the already insufficient healthcare and social systems, bringing further hardships upon those with fewer resources. People experiencing homelessness and those with substance use disorders represent an especially fragile subset of the population, often neglected and at risk for health complications, poor healthcare access, and perpetuation of homelessness.

Rapid response strategies such as emergency shelters, quick access medical consults, and low-threshold pharmacological interventions provided immediate relief as well as an opportunity to reframe care and health approaches in this population.

In this sample, 39% adhered to some form of intervention (pharmacological or alcohol-use appointment). Pharmacological intervention adherence reached 36.2% and was associated with appointment adherence and having withdrawal symptoms while being independent of time experiencing homelessness, substance use, and other analyzed variables. Qualitative perspectives from patients, technicians, and other groups should be sought to deepen understanding and inform future works. Reasons for non-adherence must be explored and mitigated to increase engagement. The potential of pharmacological intervention in social settings should be further analyzed as a strategy to increase acceptance and adherence to more structured medical interventions.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Comissão de Ética da Associação Regional de Saúde de Lisboa (Regional Health Administration Ethical Commission). The Ethics Committee waived the requirement of written informed consent for participation.

Author contributions

FA, RM, AN, AVS, CP, JT, RF, and SD contributed to the conception and design of the study. FA organized the database. FA and AS performed the statistical analysis. FA, RM, and AN wrote the first draft of the manuscript. FA, RM, AN, AG, and AS wrote sections of the manuscript. All authors contributed to the manuscript revision, read, and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Assessing longitudinal housing status using Electronic Health Record data: a comparison of natural language processing, structured data, and patient-reported history

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Introduction: Measuring long-term housing outcomes is important for evaluating the impacts of services for individuals with homeless experience. However, assessing long-term housing status using traditional methods is challenging. The Veterans Affairs (VA) Electronic Health Record (EHR) provides detailed data for a large population of patients with homeless experiences and contains several indicators of housing instability, including structured data elements (e.g., diagnosis codes) and free-text clinical narratives. However, the validity of each of these data elements for measuring housing stability over time is not well-studied.

Methods: We compared VA EHR indicators of housing instability, including information extracted from clinical notes using natural language processing (NLP), with patient-reported housing outcomes in a cohort of homeless-experienced Veterans.

Results: NLP achieved higher sensitivity and specificity than standard diagnosis codes for detecting episodes of unstable housing. Other structured data elements in the VA EHR showed promising performance, particularly when combined with NLP.

Discussion: Evaluation efforts and research studies assessing longitudinal housing outcomes should incorporate multiple data sources of documentation to achieve optimal performance.

KEYWORDS

homelessness, electronic health records, natural language processing, veterans affairs, social determinants of health

1. Introduction

Social determinants of health (SDoH) significantly impact patients' health and quality of life. Housing status is a key SDoH and ending homelessness among United States Veterans is a national priority for the Department of Veterans Affairs (VA), which provides a breadth of health and housing services for homeless-experienced Veterans (HEVs). To evaluate the effectiveness of VA homeless services, assessing short- and long-term housing outcomes is essential. However, to date, most studies that assess housing outcomes require collecting repeated patient-reported measures of housing status, which are costly and challenging to obtain.

In VA and other integrated healthcare systems, the Electronic Health Record (EHR) is a potentially valuable source of data regarding longitudinal housing outcomes. However, using EHR data for this purpose is challenging due to measurement error, missing data, and other complexities (Botsis et al., 2010; Wells et al., 2013; Glicksberg et al., 2018) which can bias outcomes assessed using longitudinal analyses (Lin et al., 2004; Pullenayegum and Lim, 2016; Lokku et al., 2021). SDoH are often recorded in the EHR using free-text clinical narratives (Organization, 2004; Gundlapalli et al., 2013, 2015; Peterson and Gundlapalli, 2015; Conway et al., 2019; Chapman et al., 2021; Hatef et al., 2022; Lybarger and Yetisgen, 2023; Tsai et al., 2022), and several studies have developed methods for extracting housing data from clinical texts (Gundlapalli et al., 2013; Conway et al., 2019; Chapman et al., 2021; Hatef et al., 2022; Lybarger and Yetisgen, 2023). In VA, one such system is Relative Housing Stability in Electronic Documentation (ReHouSED) (Chapman et al., 2021), a Natural Language Processing (NLP) system developed to extract housing stability from the EHR to evaluate VA's homelessness prevention and rapid rehousing program. ReHouSED demonstrated higher validity for identifying homeless status compared to International Classification of Diseases 10th Edition (ICD-10) codes, a set of standardized codes representing clinical diagnoses and symptoms published by the World Health Organization (Organization, 2004).

However, there are several challenges in applying ReHouSED to study housing outcomes. First, the system may need to be adjusted for particular patient cohorts or evaluating specific services. It was originally designed for HEVs engaged in a rapid rehousing program; HEVs enrolled in other homeless services may have different EHR note structures or linguistic patterns. Second, missing data may cause bias when using ReHouSED for measuring outcomes. Information is only recorded in the EHR when patients present for care, which may occur more frequently for some patients than others. This produces observations at highly irregular intervals rather than the fixed, regularly spaced assessments that are ideal for longitudinal data collection, which can lead to biased analyses unless methods account for missing data (Pullenayegum and Lim, 2016; Lokku et al., 2021). Third, measurement error is ubiquitous in studies that use EHR data, particularly when using NLP to extract information from complex free text. While NLP is often designed to improve upon the shortcomings of structured data, misclassification is still present. This is especially true for complex variables such as longitudinal housing outcomes.

In the rapid rehousing context, ReHouSED achieved moderate accuracy (average positive predictive value and sensitivity of 65.3 and 68.1, respectively) and expert annotators achieved modest inter-annotator agreement (Cohen's Kappa = 0.7) (Chapman et al., 2021), demonstrating the complexity of the task. The accuracy of housing status classification can potentially be improved by combining NLP classifications with other EHR variables (e.g., ICD-10 codes) (Gundlapalli et al., 2015; Peterson and Gundlapalli, 2015; Wang et al., 2016; Nelson et al., 2018; Tsai et al., 2022). However, the accuracy of these data elements, as well as the best combination of indices, is not well-studied, in part due to the challenge of constructing a reference standard.

We aimed to develop a "best practice" for assessing longitudinal housing instability using observational EHR data as part of a quality improvement initiative targeting VA's Grant and Per Diem (GPD) case management aftercare program (hereafter, "Aftercare"). In this program, VA partners with community-based homeless service agencies to provide 6 months of case management for HEVs undergoing housing transitions (e.g., from institutional settings to independent housing). For a cohort of Aftercare patients in Southern California, we collected patient-reported housing history for a 2-year period. We then extracted six indicators of housing instability from the VA EHR: clinical note classifications of housing status obtained using ReHouSED tailored for this cohort (Chapman et al., 2021); ICD-10 codes for homelessness; notations of homeless service use found in outpatient visits; inpatient admissions associated with homelessness (e.g., residential treatment programs); a universal screening tool to assess housing instability; and data from VA's homeless registry. We compare the validity of each indicator of housing instability, considering the patient-reported data as a gold standard, and discuss implications for evaluations of housing interventions.

2. Materials and methods

2.1. Setting and ethics

Our cohort consisted of 386 VA Greater Los Angeles patients who engaged in Aftercare between 10/1/2019 and 1/4/2021. This cohort was enrolled in a parent project evaluating the implementation of Critical Time Intervention, an evidence-based, structured, and time-limited case management practice (Herman et al., 2000; Gabrielian et al., 2022). All project activities were reviewed by VA's Central Institutional Review Board and designated as quality improvement.

We extracted patient demographics for the entire cohort including age, race, and ethnicity from administrative data collected as part of Aftercare. Additionally, we identified recent diagnoses of psychiatric and substance use disorders using ICD-10 diagnosis codes derived from the VA's National Psychosis Registry (Blow et al., 2004). We included the following conditions in our analysis: alcohol use disorders; drug use disorders; schizophrenia spectrum and other psychotic disorders; bipolar disorders; major depressive disorder; anxiety disorders; and post-traumatic stress disorders. The complete list of ICD-10 codes can be found in the Supplementary material. Of note, we did not assess for the presence of dementia or other major neurocognitive

disorders (exclusion criteria from the housing program in which this cohort was engaged); mental retardation (which is incompatible with military service); or personality disorders (which are inaccurately captured in VA administrative data). Diagnosis codes were retrieved from outpatient and inpatient settings in the year preceding the patient lookback period (defined in the following paragraph).

2.2. Patient-reported housing outcomes

We recruited a random subsample of 61 patients from the cohort for detailed telephone assessments of their housing status from 7/1/2020 and 6/30/2022. The goal was to create a reference standard to enable refinement of EHR methodologies for assessing housing status. We sent recruitment letters to 188 randomly selected Veterans, 19 of whom opted into the study. 158 of the remaining Veterans received follow-up recruitment calls and 41 volunteered to participate.

Following verbal informed consent, assessments were conducted with the Residential Time-Line Follow Back (TLFB) inventory, a validated instrument that collects retrospective housing status (Mendelson et al., 2010). The TLFB assigns codes for 34 different housing types (e.g., "On the street or in other outdoor place," "Own apartment or house") and classifies each type to one of four categories: "Literal Homelessness," "Temporary," "Stable," and "Institutional." In these analyses, we collapsed "Literal Homelessness" and "Temporary Housing" into a single "Unstable" category. Except for inpatient admissions coded as "Hospital (medical only)," any "Institutional" code was also considered to be "Unstable." This meant that short-term institutional facilities, such as residential programs or crisis housing, were considered unstable.

Using standardized TLFB procedures, participants reported all changes in housing status over the specified period. We defined patient episodes as a continuous period spent "stable" or "unstable." For example, patients who were stably housed during the entire period had a single episode (even if they changed addresses or moved to a different subcategory of stable housing), whereas a patient who was stably housed at the beginning of the period but then became unstably housed for the rest of the period had two episodes.

2.3. EHR indicators of housing status

EHR data for all patients in this subsample was obtained from VA's Corporate Data Warehouse (CDW), a national repository of demographics, diagnoses, clinical narratives, and other clinical and administrative data. Additional data was retrieved from the VA's homeless service registry and linked to CDW data.

2.3.1. NLP system

We used ReHouSED to extract housing status from clinical notes in the subset of patients who completed telephone interviews (Chapman et al., 2021). ReHouSED is a rule-based system implemented in medspaCy (Eyre et al., 2021) that was originally developed to extract housing outcomes from HEVs participating in VA's rapid rehousing program. Rules are hand-crafted to define semantic phrase and syntactic patterns, matching entities related to homelessness (e.g., "sleeps in the park," "needs shelter") and housing stability (e.g., "lives in an apartment," "no concerns about housing"). Each entity is then linked to any linguistic modifiers such as phrases indicating negation (e.g., "not currently") or risk (e.g., "worried about being evicted"). Notes are also parsed to identify the clinical note sections, such as past medical history or social history. This contextual information is used to interpret whether each entity is referring to the patient's current housing status and whether they are stably housed. Based on text in a note, each note is assigned one of three housing status classifications: "Stable," "Unstable," or "Unknown." The last of these classifications refers to notes that include some mention of housing or discussion of a patient's history of housing instability but have no discernible statement of the patient's current housing status. Examples of documents classified as "Unstable" and "Stable," respectively, are shown in Figure 1.

Using a random sample of 250 notes from the larger cohort ($n = 386$), we tailored ReHouSED to fit housing outcome classifications pertinent to Aftercare. First, we identified clinical note templates and phrases related to the receipt of VA permanent supportive housing services (independent housing with financial subsidies and supportive services). Though ReHouSED initially classified permanent supportive housing as "Unstable," we conceptualized permanent supportive housing as a positive ("Stable") outcome for Aftercare patients. Second, while ReHouSED prioritized mentions of stable housing over mentions of homelessness or temporary housing in a clinical note, we modified the document classification logic to prioritize current mentions of VA's residential treatment program for HEVs (known as the Domiciliary); for HEVs engaged in Aftercare, enrollment in residential treatment was considered a negative ("Unstable") outcome. Last, based on a review of this sample of notes, we added a small number of additional concepts that were not included in the original ReHouSED system (e.g., "currently incarcerated," "sober home").

We processed all notes mentioning housing keywords for interviewed patients during the 2-year assessment period. The housing keywords and additional exclusion criteria are the same as those described by Chapman et al. (2021). If multiple notes mentioning housing were present on a single day, we classified the encounter as "Unstable" if at least half of the notes were classified as "Unstable" after excluding "Unknown" notes. If fewer than half were classified as "Unstable," or if there were no notes classified as "Stable" or "Unstable," the housing status that day was deemed "Stable."

2.3.2. Structured EHR data

We abstracted demographic data (age, gender, race, ethnicity) from the EHR. We also obtained structured EHR data elements that indicate housing instability: ICD-10 codes for behavioral health disorders (psychiatric diagnoses and substance use disorders); outpatient administrative data that indicate receipt of homeless services; inpatient administrative data that describe admission to programs for HEVs; and a homelessness screening tool. Each data

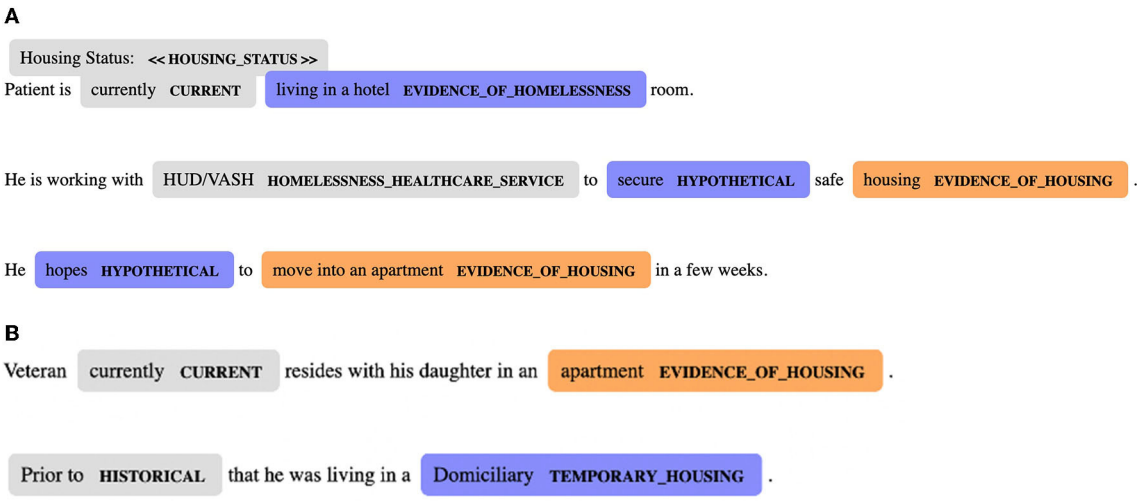

FIGURE 1
(A) A clinical note classified by ReHouSED as "Unstable." The note states that the patient is living in a hotel and hopes to move into stable housing soon. HUD-VASH, HUD-Veterans Affairs Supportive Housing. **(B)** A clinical note classified by ReHouSED as "Stable." The note mentions the patient's history of living in unstable housing but states that the patient is currently stably housed.

element is detailed below. Specific value sets for each data element are provided in the Supplemental material.

ICD-10 codes: Several ICD-10 codes associated with outpatient visits or inpatient care indicate homelessness or risk of homelessness (e.g., "Z59.0: Homelessness, unspecified"). We retrieved all ICD-10 codes pertaining to homelessness or risk of homelessness during the study period. We conceptualized a patient as unstable if there was a homeless-associated ICD-10 code on a given day.

Outpatient administrative data: In VA EHR, the type of outpatient clinical service is coded. We identified codes indicating use of VA homeless services and considered an encounter unstable if the Veteran received care from any of these services.

Inpatient administrative: For all hospital stays in the study cohort, we identified residential treatment programs for HEVs (conceptualized as inpatient admissions in VA, e.g., the "Domiciliary Care for Homeless Veterans (DCHV) program").

Homelessness screener: The Homelessness Screening Clinical Reminder (HSCR) is an instrument delivered to all Veteran outpatients to routinely screen for recent housing instability or risk of housing instability (Montgomery et al., 2022). Responses to this screener are saved in the EHR as structured data elements. We identified positive responses from interviewed Veterans.

2.3.3. Homeless service registry data

The VA maintains an administrative database of homeless services provided to Veterans by the VA or its community partners, referred to as the homeless service registry (HOMES). We queried this database for enrollment and exit dates into housing assistance programs and considered patients to be unstably housed during their enrollment period.

2.4. Analyses

2.4.1. TLFB data

Using TLFB data, we calculated the count, percent of episodes, and total person-days spent in each of three categories: unstable, stable, and institutional. Because days spent in institutional settings (e.g., hospital admissions not related directly to homelessness) were expected to be uncommon and captured using inpatient administrative data, episodes assigned to this category were excluded from further analyses. We also derived a binary variable indicator whether the patient reported housing instability at any point in the 2-year assessment period. We measured the association between housing instability at any point with baseline characteristics (i.e., demographic variables and psychiatric diagnoses) using a logistic regression model.

2.4.2. VA service use frequency and type

Analyses using EHR data depend on documentation of patients' service use, leading to missing data on days when patients are not engaged with the VA health system. To assess patterns of service utilization and corresponding rates of missingness, we calculated descriptive statistics of the frequency of encounters, defined as any inpatient or outpatient service documented in the EHR. We calculated the count and proportion of patients, person-days, and person-months with at least one encounter in VA during the data collection period. We also calculated the mean and standard deviation of the number of encounters per month. To assess the number of clinical notes discussing housing, we repeated each calculation limited to encounters that contained notes classified by ReHouSED as "Stable" or "Unstable." To explore whether rates of encounter frequency differed between stably and unstably housed individuals, which could cause bias in longitudinal analyses, we stratified these statistics by whether they were ever unstably housed during the data collection period. We

TABLE 1 Sample demographics.

Characteristic	Interviewed		
	Yes, $n = 61$	No, $n = 325$	Overall, $n = 386$
Age (mean, SD, in years)	60.6, 11.3	59.7, 14.7	59.8, 14.2
<40 years (*n*, %)	2 (3.3%)	45 (13.8%)	47 (12.2%)
40–50 years (*n*, %)	11 (18.0%)	39 (12.0%)	50 (13.0%)
50–60 years (*n*, %)	9 (14.8%)	43 (13.2%)	52 (13.5%)
>60 years (*n*, %)	39 (63.9%)	198 (60.9%)	237 (61.4%)
Self-identified gender (n, %)			
Female	9 (14.8%)	28 (8.6%)	37 (9.6%)
Male	52 (85.2%)	297 (91.4%)	349 (90.4%)
Race (*n*, %)			
American Indian/Alaska Native	0 (0.0%)	11 (3.4%)	11 (2.8%)
Black/African American	33 (54.1%)	135 (41.5%)	168 (43.5%)
Native Hawaiian/Other Pacific Islander	1 (1.6%)	3 (0.9%)	4 (1.0%)
White	24 (39.3%)	147 (45.2%)	171 (44.3%)
Missing/Other	3 (4.9%)	29 (8.9%)	32 (8.3%)
Ethnicity (*n*, %)			
Hispanic or Latino	3 (4.9%)	40 (12.3%)	43 (11.1%)
Not Hispanic or Latino	56 (91.8%)	269 (82.8%)	325 (84.2%)
Missing/Other	2 (3.3%)	16 (4.9%)	18 (4.7%)
Psychiatric and substance use disorders (*n*, %)			
Bipolar disorder	1 (1.6%)	8 (2.5%)	9 (2.3%)
Major depressive disorder	19 (31.1%)	86 (26.5%)	105 (27.2%)
Anxiety disorder	9 (14.8%)	56 (17.2%)	65 (16.8%)
Post-traumatic stress disorders	16 (26.2%)	80 (24.6%)	96 (24.9%)
Schizophrenia spectrum and other psychiatric disorders	2 (3.3%)	17 (5.2%)	19 (4.9%)
Alcohol use disorder	8 (13.1%)	54 (16.6%)	62 (16.1%)
Drug use disorder	9 (14.8%)	42 (12.9%)	51 (13.2%)

N, number of patients; SD, standard deviation.

visually characterized encounter frequency in these two groups by plotting encounters over time using an abacus plot (Lokku et al., 2021).

TABLE 2 Summary of patient-reported housing status episodes from 7/1/2020 - 6/30/2022, obtained using the Residential Time-Line Follow Back (TLFB) inventory on a cohort of 61 patients.

Characteristic	Institutional	Stable	Unstable
Number (%) of patients reporting at least one housing episode (total number of patients = 61)	4 (6.6%)	56 (91.8%)	12 (19.7%)
Number (%) of episodes in each category (total number of episodes = 97)	4 (4.1%)	74 (76.3%)	19 (19.6%)
Number (%) person days spent in each category (total number of person-days = 39,868)	112 (0.3%)	35,953 (90.2%)	3,803 (9.5%)
Episode duration, in days			
Minimum	1	38	3
Maximum	74	729	667
Mean (SD)	28 (33.1)	485.9 (253.4)	200.2 (226.6)
Median	18	578	91

SD, Standard deviation.

2.4.3. Validity of EHR indicators

We assessed the accuracy of each individual EHR indicator for differentiating stable vs. unstable housing. First, we calculated the proportion of ever unstably housed and never unstably housed patients who had each indicator. Indicators found to be present for less than two unstably housed patients were excluded from subsequent analyses. For the remaining indicators, we calculated encounter- and month-level sensitivity and specificity for each indicator. For encounter-level performance, we calculated sensitivity as the proportion of encounters during an episode of unstable housing where that indicator was present, and specificity as the proportion of encounters during stable episodes that did not have the indicator. We considered each of the EHR indicators individually as well as different combinations of EHR indicators (e.g., NLP and ICD-10 codes denoting housing instability). Bootstrapping was used to construct 90% confidence intervals.

A limitation of measuring the performance of EHR indicators at the encounter level is that many VA visits may not include documentation of a patient's housing status. For example, visits for medical/surgical procedures generally do not include documentation of housing status and would be counted as false negatives in the encounter-level sensitivity. To account for this, we first limited the data to encounters where the patient had at least one note classified as "Stable" or "Unstable" by ReHouSED; this required an explicit NLP classification of housing status and does not equate the absence of documented unstable housing to stable housing. Second, we aggregated data to patient-months. For each patient, the patient's housing status was considered unstable if he/she reported an episode of unstable housing that overlapped

TABLE 3 Coefficients for logistic regression model relating baseline characteristics and diagnoses and reporting housing instability at any point between 7/1/2020-6/30/2022 for a sample cohort 61 patients.

Characteristic	OR	90% CI
Age	0.99	0.93, 1.06
Ethnicity not Hispanic or Latino	REF	REF
Hispanic or Latino	0.10	0.00, 1.54
Race White	REF	REF
Non-white	0.30	0.06, 1.32
Gender Male	REF	REF
Female	1.01	0.08, 7.49
Any psychiatric disorder*	7.85	1.61, 56.4
Substance use disorder**	22.7	4.75, 146

OR, Odds ratio; CI, Confidence interval.
*Psychiatric disorders include bipolar disorder, major depressive disorder, anxiety disorders, post-traumatic stress disorders, or schizophrenia spectrum/other psychotic disorders.
**Substance use disorders include alcohol use disorder, cannabis use disorder, cocaine use disorder, opioid use disorder, hallucinogen use disorder, sedative use disorder, and other stimulants/psychoactives use disorders.

with that month. A patient-month was classified as unstable if at least half of a patient's encounters during that time had indicators of instability. This month-level analysis was limited to patient-months that had at least one VA service use.

Unlike EHR data, the HOMES data records start and end dates of service use, removing the need for a patient to present for medical care to ascertain their housing status. To compare HOMES vs. EHR data, we restricted HOMES records to days in which patients had an EHR-recorded encounter, but separately calculated the total proportion of person-days (with or without an encounter) captured using HOMES data.

3. Results

Table 1 summarizes demographics for patients who provided self-reported housing history ("interviewed") vs. those who did not. Among interviewed patients, most (63.9%) were >60 years old and 85.2% were male. Over half (54.1%) were African American. Among the entire cohort, the most common psychiatric diagnoses were major depressive (27.2%) and post-traumatic stress disorders (24.9%), with a smaller proportion of patients demonstrating evidence of drug use (13.2%), alcohol use (16.1%), or psychotic spectrum disorders (4.9%).

3.1. Patient-reported housing status

Table 2 summarizes patient-reported housing episodes, stratified as institutional, unstable, or stable. Most of the cohort was stably housed during the period examined, with most patients ($n = 56$, 91.8% of all patients) reporting stable housing at least once during the period, for a total of 35,953 person-days. Fewer ($n = 12$, 19.7%) patients reported being unstably housed at least once, for a sum of 3,803 person-days. Episodes of stable housing typically lasted longer than episodes of unstable housing (mean 486 days vs. 200 days). Very few ($n = 4$, 6.6%) patients reported time spent in institutions, accounting for a total of 112 person-days. These 112 days (presumed to be hospitalizations) are excluded in subsequent analyses.

The coefficients for the logistic regression model of housing instability at any point are shown in Table 3. There was no significant association between housing instability and any demographic variables (i.e., race, ethnicity, age, or gender) and housing instability, but there was some evidence of higher odds of housing instability for patients diagnosed with one or more psychiatric disorders (odds ratio = 7.85, 90% confidence interval = [1.61, 56.4]), as well as one or more substance use disorders (22.7 [4.75, 146]).

3.2. EHR encounters

Most (58) patients had an encounter at some point over the 2 years. Patients who experienced unstable housing had more encounters per month compared to patients who remained stably housed (mean 7.0 vs. 5.1, ratio = 1.37). Limiting to encounters with notes mentioning housing, this ratio increased slightly (mean 3.6 vs. 2.4, ratio = 1.5). Similarly, patients with unstable housing experiences had a higher probability of having at least one encounter in a given month. This difference in visit frequency is shown visually in Figure 2, which plots visit frequency over the 1st year of the study period for a randomly selected subsample of 12 patients with no unstable housing (top panel) and the 12 patients who reported unstable housing (bottom). Points represent an encounter at the specified time point, with shape representing the patient's reported housing status at the time (unstable encounters are marked by solid circles, while stable encounters are marked by an "x"). There is clear variation across patients in visit frequency. Unstable episodes are characterized by dense clusters of visits, while periods of stable housing tend to be sparser and more spread out, suggesting that this population of patients may interact with the VA healthcare system less frequently during long periods of housing stability

3.3. Validity of EHR indicators

Of the 12 patients who reported at least one unstably housed experience on the TLFB, 11 (91.6%) had some documentation of unstable housing over the assessment period, while 1 (8.4%) did not have any data elements indicating housing instability. NLP, ICD-10 codes, and outpatient administrative data were each present for all of these 11 patients, while the inpatient variables and the homelessness screener were each used with only 1 patient. Most (8/12, 66.7%) patients with unstable housing experiences were recorded in HOMES as having received homeless services.

We examined encounter- and month-level sensitivity and specificity for NLP, ICD-10 codes, outpatient data, and HOMES, as well as combinations of the structured EHR data and NLP. Table 4 shows the results for individual indicators, combinations

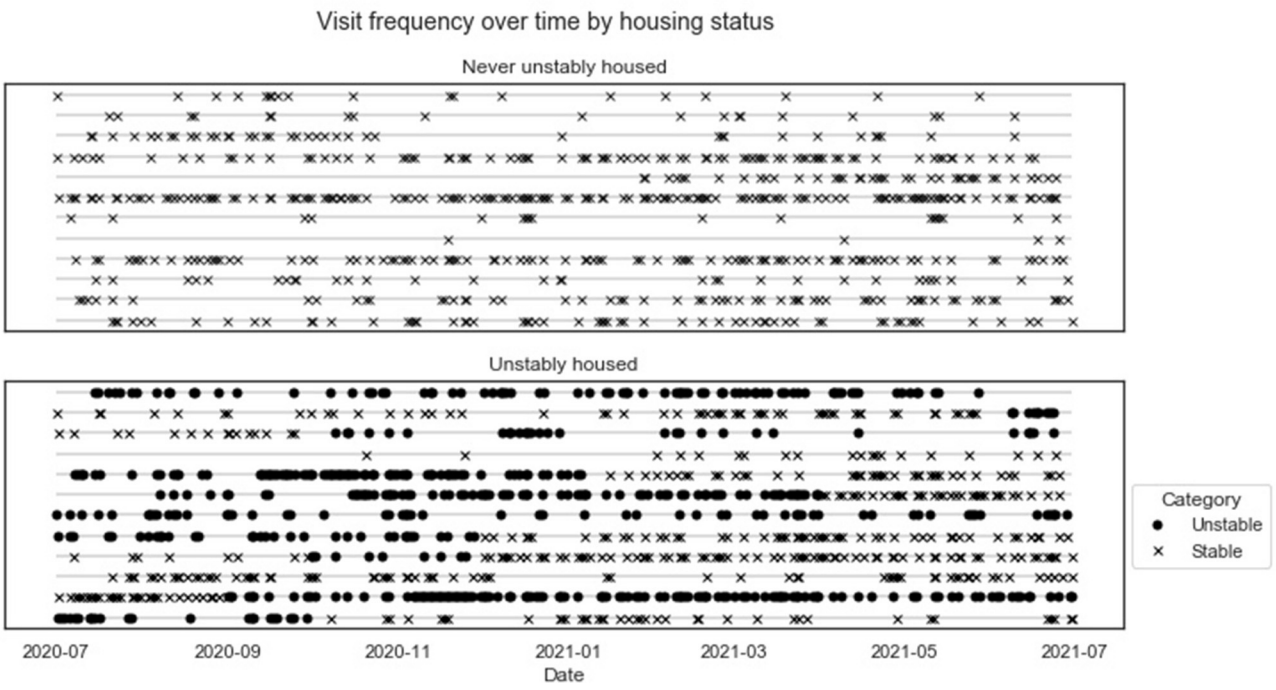

FIGURE 2
An abacus plot displaying the frequency of patient visits over time. The **top** panel displays visits for a subsample of patients who were stably housed during the first year of the assessment period. The **bottom** panel display panels for patients who were unstably housed at some point in the assessment period, with encounters on unstably housed days shown in solid circles.

of NLP and ICD-10 codes, and combinations of NLP and any structured data, including VA-specific data elements; data were restricted to person-days and months where the patient had a VA encounter. At the encounter level, NLP displayed higher sensitivity (0.197, bootstrapped 90% CI = [0.143, 0.251]) than ICD-10 codes (0.098 [0.039, 0.157]) and outpatient data (0.102 [0.074, 0.129]), but lower sensitivity than HOMES (0.268 [0.076, 0.459]). Bootstrapped confidence intervals for sensitivity were wide due to the small number of unstably housed patients The widest confidence intervals were observed for HOMES data due to high between-subject variation (i.e., only 66.7% of unstably housed patients were in the registry). Encounter-level specificity was highest for HOMES (0.969 [0.947, 0.990]) and outpatient data (0.967 [0.950, 0.983]), and lower for NLP (0.948 [0.936, 0.960]) and ICD-10 codes (0.943 [0.922, 0.964]).

When limited to encounters with notes pertaining to housing, NLP had the highest sensitivity (0.689 [0.595, 0.782]) and the lowest specificity (0.658 [0.599, 0.717]). The other three indicators each saw increased sensitivity and decreased specificity, although the change was less extreme than for NLP. When aggregating to the month level, NLP again saw the highest sensitivity (0.421 [0.313, 0.529]). HOMES, which had the highest encounter-level sensitivity, had the lowest sensitivity at the patient-month level (0.254 [0.082, 0.427]) due the high percentage of patients (66.7%) who were not captured in this dataset. ICD-10 codes had the lowest sensitivity (0.298 [0.207, 0.389]) and lowest specificity (0.858 [0.809, 0.907]).

Composite measures using any of the three structured elements had higher sensitivity and lower specificity than any of the structured elements at each level of analysis. A similar pattern was observed when using NLP or any structured data. Requiring NLP and structured EHR data of housing instability achieved lower sensitivity and higher specificity than NLP or HOMES individually but maintained higher sensitivity as well as specificity than when using only ICD-10 codes and outpatient administrative data.

Across all person-days during the assessment period regardless of whether the patient had an encounter, HOMES had a sensitivity of 0.2 [0.067, 0.335] and specificity of 0.971 [0.954, 0.996]. The sensitivity achieved at the person-day level using the combination of all three EHR indicators (i.e., patients having at least one of NLP, ICD-10, or outpatient administrative data) was 0.06 [0.03, 0.08], showing an advantage of using HOMES administrative data that did not require patients to present for care.

4. Discussion

We compared patient-reported housing history with clinical and administrative data regarding housing status for a cohort of homeless-experienced VA patients. Our goal was to compare the validity of different data elements to identify best practices for assessing longitudinal housing outcomes using EHR data. Among the small number of patients who experienced housing instability in our cohort, most had EHR documentation of their housing status. Using NLP to supplement standard structured data elements with information recorded in clinical notes NLP led to more complete assessment of longitudinal housing outcomes. This is an important finding with methodologic implications for optimizing the validity of assessing patients' longitudinal housing outcomes using EHR

TABLE 4 Sensitivity and specificity, and confidence intervals, for four EHR indicators of unstable housing at the encounter and month level.

	Encounter		Encounters with notes documenting housing status		Month	
EHR indicator	Sensitivity (n = 796)	Specificity (n = 4,932)	Sensitivity (n = 228)	Specificity (n = 749)	Sensitivity (n = 114)	Specificity (n = 962)
NLP	0.197 (0.143, 0.251)	0.948 (0.936, 0.960)	**0.689 (0.595, 0.782)**	0.658 (0.599, 0.717)	**0.421 (0.313, 0.529)**	0.876 (0.847, 0.906)
ICD-10	0.098 (0.039, 0.157)	0.943 (0.922, 0.964)	0.224 (0.095, 0.352)	0.862 (0.820, 0.904)	0.298 (0.207, 0.389)	0.858 (0.809, 0.907)
Outpatient admin	0.102 (0.074, 0.129)	0.967 (0.950, 0.983)	0.259 (0.190, 0.328)	0.919 (0.872, 0.965)	0.360 (0.238, 0.481)	0.878 (0.826, 0.931)
HOMES	**0.268 (0.076, 0.459)**	**0.969 (0.947, 0.990)**	0.311 (0.063, 0.560)	**0.928 (0.869, 0.986)**	0.254 (0.082, 0.427)	**0.964 (0.935, 0.992)**
NLP or ICD-10	**0.246 (0.187, 0.306)**	0.900 (0.873, 0.928)	**0.741 (0.653, 0.830)**	0.581 (0.523, 0.638)	**0.535 (0.433, 0.637)**	0.778 (0.727, 0.828)
NLP and ICD-10	0.049 (0.012, 0.086)	**0.991 (0.987, 0.995)**	0.171 (0.055, 0.287)	**0.940 (0.917, 0.963)**	0.184 (0.119, 0.250)	**0.956 (0.938, 0.974)**
Any structured	0.377 (0.206, 0.548)	0.897 (0.866, 0.927)	0.592 (0.410, 0.774)	0.768 (0.697, 0.838)	0.518 (0.416, 0.619)	0.775 (0.711, 0.840)
NLP or any structured	**0.450 (0.298, 0.602)**	0.861 (0.826, 0.895)	**0.846 (0.769, 0.924)**	0.531 (0.464, 0.599)	**0.640 (0.525, 0.756)**	0.712 (0.649, 0.775)
NLP and any structured	0.124 (0.068, 0.181)	**0.984 (0.978, 0.990)**	0.434 (0.272, 0.596)	**0.895 (0.853, 0.936)**	0.298 (0.218, 0.378)	**0.940 (0.916, 0.964)**

n, Number of encounters (columns 1-2), encounters with notes (columns 3-4), and patient-months (columns 5-6); NLP, Natural language processing; ICD-10, International Classification of Diseases (10th edition); HOMES, Homelessness service registry data.
*Structured data = ICD-10, outpatient data, or HOMES.
The highest individual and compositive sensitivity and specificity are shown in bold.

data when patient-level data collection is not feasible due to sample size or resource constraints.

In these analyses, sensitivity and specificity varied by EHR extraction method. NLP generally had higher sensitivity than structured EHR data for capturing repeated occurrences of housing instability, but demonstrated lower specificity than some structured elements. ICD-10 codes, which are often used in epidemiologic studies, had lower sensitivity and specificity than most other indicators, including NLP. Combining NLP and ICD-10 codes increased sensitivity but decreased specificity. These findings build on prior work with ReHouSED in a distinct cohort of VA patients engaged in rapid rehousing (Chapman et al., 2021); at the patient-month level, both analyses provide evidence that ReHouSED performs better than ICD-10 codes in measuring housing instability.

The VA EHR contains data elements for documenting housing instability that are unique to VA. In particular, outpatient administrative data had higher specificity than NLP and higher sensitivity than ICD-10 codes. Combinations of these three elements could be used to tailor definitions to improve sensitivity or specificity as appropriate for a particular cohort or analysis. Additionally, while encounter- and month-level performance varied across different data elements, patient-level sensitivity was similarly high for NLP, ICD-10 codes, and outpatient administrative data, suggesting structured data may be sufficient for constructing coarse definitions of housing instability (e.g., identifying patients with a history of housing instability at any point in time).

When patients received services recorded in HOMES, those episodes of housing instability were captured with high sensitivity and specificity. However, this dataset does not capture an important segment of the population that is disengaged from VA homeless services; our data suggests that quality improvement leaders and researchers using HOMES to assess housing outcomes should consider complementing this data with EHR data elements. These findings parallel prior work (Tsai et al., 2022) comparing estimated prevalence of homelessness across VA, which found that utilizing multiple EHR data elements can improve ascertainment of housing instability.

When deciding how to define housing instability using EHR data, we suggest that specific analytic goals and the underlying prevalence of housing instability be taken into consideration. Analyses examining cohorts with low prevalence of housing instability, as we had here, may demand high specificity to avoid large numbers of false positives. Specificity can be improved by requiring multiple data elements to show evidence of housing instability or by favoring more specific data elements. When high sensitivity is more desirable, using NLP or the union of multiple data elements may be more effective. Attention should also be given to missing data, as EHR data depends on patients presenting for care. Patients experiencing housing instability may use care more frequently, leading to an imbalance in the degree of observation for stably and unstably housed patients. To avoid biased results, longitudinal analyses of housing instability using EHR data should consider utilizing methods for adjusting for missing data and irregular observations (Lin et al., 2004; Pullenayegum and Lim, 2016; Pullenayegum and Scharfstein, 2022).

This work has limitations. First, we performed these exploratory analyses on a small sample and thus our statistical analyses had had low power. Regardless, the detailed patient-reported housing history we obtained over a 2-year period in patients with homeless experiences is a valuable observational dataset and our findings will inform future work. As with any retrospective analyses using patient-reported data, there is a possibility of recall or recruitment bias in our sample. Interviewed patients differed slightly in terms of race/ethnicity (i.e., interviewed patients were more likely to be African-American than the rest of the cohort and less likely to be Hispanic/Latino). They had similar distributions of psychiatric and substance use diagnoses, although the reported proportions only represent patients receiving clinical services related to these conditions and may not be reliable due to the inaccuracy of ICD-10 coding. To check for possible differential housing instability, we compared the EHR documentation of housing instability between interviewed and non-interviewed patients and found the two groups to be similar in terms of the frequency of documented housing instability, offering some assurance against recruitment bias; however, such bias remains a possibility. Second, we treated each indicator of housing instability as dichotomous. However, accuracy may be improved by factoring information such as the number of notes processed by the NLP during a single encounter or different levels of structured data (e.g., ICD-10 codes indicating risk of homelessness vs. literal homelessness). Third, we examined a cohort of VA patients from one geographic area enrolled in a particular housing program. The observed patterns here of housing instability and EHR documentation may not generalize to other cohorts of Veterans or to populations outside of the VA, who demonstrate different demographic characteristics and documentation patterns. However, documentation of housing and other SDoH is common in clinical texts, and ICD-10 codes are widely used across healthcare systems. We demonstrated here that ReHouSED could be tailored for a new cohort and analysis task, and other work has demonstrated the feasibility of customizing NLP systems developed in VA to be applied in other settings (Chapman et al., 2022). Additionally, this analysis was performed using data from the VA's legacy EHR, VISTA, which is planned to be replaced by Cerner. Future work should compare these findings with data in Cerner to ensure continuing data quality and accuracy.

5. Conclusions

Longitudinal housing status is an important outcome for patients who have experienced homelessness. For a sample of 61 homeless-experienced VA patients enrolled in a case management program, we found that housing status was documented longitudinally in the EHR using several structured and unstructured data elements. Using NLP to extract information from clinical notes can improve sensitivity for assessing housing outcomes, while incorporating multiple EHR indicators of housing instability achieves higher specificity compared to single indicators. Future work could customize ReHouSED for processing clinical texts within and outside VA for distinct patient cohorts, augmented by other EHR elements. Similar approaches could also be employed to evaluate other SDoH variables longitudinally using NLP.

Data availability statement

The datasets presented in this article are not readily available because due to the sensitive and protected nature of this data, the authors are unable to make it available to the public. Requests to access the datasets should be directed to alec.chapman@hsc.utah.edu.

Ethics statement

The studies involving human participants were reviewed and approved by VA Central Institutional Review Board, U.S. Department of Veterans Affairs. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

Author contributions

AC contributed to conceptualization, study design, NLP system development, data curation, data analysis, system evaluation, and manuscript preparation. KCo and SG contributed to conceptualization, study design, data curation, system evaluation, and manuscript preparation. SC, TP, and DA contributed to conceptualization, study design, data curation, primary data collection, and manuscript preparation. NJ contributed to conceptualization, study design, data analysis, and manuscript preparation. KCl and JT contributed to data curation and manuscript preparation. RN and AM contributed to conceptualization, study design, NLP system development, data curation, and manuscript preparation. EF contributed to conceptualization, study design, and manuscript preparation. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/frai.2023.1187501/full#supplementary-material

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A systematic review of approaches to improve medication adherence in homeless adults with psychiatric disorders

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Introduction: Medication non-adherence is a significant problem among homeless individuals with psychiatric disorders in the United States. We conducted a systematic review to identify strategies to improve psychiatric medication adherence among homeless individuals with psychiatric disorders, including substance use disorders.

Methods: We searched seven databases (MEDLINE, Embase, PsychInfo, Scopus, Web of Science, CDSR, and CENTRAL) and screened 664 studies by title and abstract followed by full-text review. Our inclusion criteria were studies that: involved an intervention for homeless adults with psychiatric disorders, reported a quantitative outcome of medication adherence, and were published in English in a peer-reviewed journal. We rated the relative effectiveness of strategies described in each study using a self-designed scale.

Results: Eleven peer-reviewed studies met criteria for inclusion in this review. Within these studies, there were seven different approaches to improve medication adherence in this population. Three studies were randomized controlled trials (RCTs) and the remaining were observational studies. Outpatient interventions included Assertive Community Treatment, Cell Phone-Assisted Monitoring, Customized Adherence Enhancement plus Long-Acting Injectable Medications, and Homeless-Designated Pharmacy Clinics. Residential, shelter-based, and inpatient interventions included use of the Housing First model, Modified Therapeutic Communities, and Homeless-Designated Inpatient Care. The approaches described in four of the eleven studies were rated as scoring a 3 or higher on a 5-point scale of effectiveness in improving medication adherence; none received 5 points.

Discussion: The interventions with the strongest evidence for improving medication adherence in this population were Assertive Community Treatment, Customized Adherence Enhancement plus Long-Acting Injectable Medications, and Housing First. Overall, studies on this topic required more rigor and focus on medication adherence as an outcome in this population. This review highlights several promising strategies and the need for larger RCTs to determine effective and diverse ways to improve medication adherence among homeless adults with psychiatric disorders.

KEYWORDS

Homelessness, psychiatric disorders, medication non-adherence, Housing First, Assertive Community Treatment, Long Acting Injectable Antipsychotic

1 Introduction

Medication non-adherence is an important problem among people with psychiatric disorders experiencing homelessness. Adherence to prescribed psychotropic drugs is associated not only with improved clinical outcomes but also improved housing outcomes (1). However, a minority (as low as 12%) of homeless individuals reach therapeutic efficacy with their prescribed psychotropics (2). Homelessness itself presents unique challenges to medication adherence, which require tailored approaches to improve adherence in this population. To our knowledge, there has been no systematic review of interventions targeted specifically to homeless adults with psychiatric disorders. In this paper, we present a systematic review of the literature on strategies that have been used to improve medication adherence among people with psychiatric disorders experiencing homelessness.

Homelessness is a recalcitrant public health problem in the United States that incurs high healthcare and societal costs. In the 2022 fiscal year, the U.S. allocated nearly $8 billion in federal funding for homeless assistance programs (3). Further, since 2021, the U.S. has allocated over $46 billion in emergency rental assistance to address the needs of an affordable housing crisis (4). Despite this, a significant proportion of persons with chronic homelessness continue to struggle with maintaining permanent housing. The U.S. Department of Housing and Urban Development (5) Annual Homeless Assessment Report to Congress notes that roughly 582,500 people were experiencing homelessness on a given night (5). That same year, 30% of those who experienced homelessness were chronically homeless, most of whom have psychiatric disorders (5). This marked an increase in chronic homelessness for the sixth year in a row, and the highest proportion of chronic homelessness reported in recent U.S. history (5).

Compared to housed individuals, homeless individuals report having a significantly lower quality of life in many domains, including safety, health, and social relationships (6). Compared to persons who were never homeless, those with unstable housing are more likely to be repeatedly hospitalized—including at residential/inpatient mental health facilities—and are also more likely to utilize acute care services, including urgent care and emergency departments (7–11). Homeless individuals also have a higher mortality rate than the general population (12–14), and this risk of mortality is particularly high in the United States compared to other developed countries (15). A significant proportion (30–40%) of chronically homeless people have a serious psychiatric disorder, such as schizophrenia and bipolar disorder (16, 17). Epidemiological and population-based studies in the United States estimate that 22–73% of homeless adults have a severe psychiatric disorder (7, 18–20); and conversely, 15% of people with a severe psychiatric disorder experience homelessness (7). Substance abuse and psychotic disorders have been identified as some of the strongest risk factors for homelessness aside from extreme poverty (7, 21, 22).

For chronically homeless individuals, one potential barrier to housing stability and improved quality of life is non-adherence to psychiatric medications. Antipsychotic medications are a mainstay first-line treatment for adults with schizophrenia-spectrum disorders and bipolar disorder (23, 24). While there remain concerns about side effects and variability in response to antipsychotic medications, rigorous large-scale studies have found that antipsychotic medications are effective in preventing symptom relapse and rehospitalization among adults with psychotic disorders (23, 25). Other psychotropic medications such as antidepressants and anxiolytics are also commonly used to treat mental health conditions among homeless adults (8, 26, 27). However, access to and adherence to psychotropic medications among homeless adults are of major public health concern (28, 29).

1.1 Prevalence of medication non-adherence among people with homelessness

As a result of a complex set of adherence challenges, medication non-adherence may be more prevalent among homeless individuals than housed individuals. Up to 60% of homeless individuals report having been prescribed a medication, while roughly one third report being unable to comply with dosing—particularly those who are younger or uninsured (9, 28, 30, 31). However, there is limited research that directly compares psychiatric treatment adherence between homeless and housed populations. Previous systematic reviews and retrospective studies of pharmacy records have found that psychiatric patients take on average 44–58% of their prescribed antipsychotics (32, 33), while homeless individuals take on average 30–41% of their prescribed antipsychotics (2, 34). An analysis of Medicaid claims and pharmacy records for individuals with schizophrenia in San Diego County, CA found that only 26% of the homeless population was adherent (medication possession ratio $\geq$ 0.8), whereas 36–50% of individuals in other living situations were adherent (35). Further, in a study of housed and homeless patients with HIV/AIDS, homeless individuals were significantly more likely to report having missed an antiretroviral dose in the past 48 h and having been noncompliant with their medication regimen in the past 30 days (36). Challenges with medication adherence for other diseases like tuberculosis and Hepatitis C have also been documented (37, 38). One previous national study, using administrative data from the U.S. Department of Veterans Affairs (VA) from 2010, examined the psychopharmacology of homeless veterans and found that homeless veterans with psychiatric disorders had 16% fewer psychotropic prescription fills than non-homeless veterans (8). This included 23% fewer antipsychotic refills and 25% fewer sedative-hypnotic refills. An analysis of VA National Psychosis Registry data found that among veterans with bipolar disorder and homelessness, only 38% reached the target adherence rate (80%) of their prescribed antipsychotic medication (39). In that sample, 62% of homeless veterans were non-adherent and 39% took less than half of their prescribed antipsychotics.

1.2 Factors contributing to medication non-adherence

Risk factors for psychiatric medication non-adherence among homeless people with psychiatric disorders include racial/ethnic minority background (40), major psychiatric disorders such as schizophrenia, bipolar disorder and substance use disorders, presence of cognitive impairment (41), and history of traumatic brain injury (42). There has not been adequate research to determine whether non-adherence to psychiatric medications is higher among homeless individuals with certain psychiatric conditions. A multivariable

analysis of the 2003 Health Care for the Homeless User Survey found several factors independently associated with unmet needs for prescription medication, including lack of health insurance coverage, older age, out-of-home placement as a minor, past-year victimization, past-year employment, food insufficiency, and presence of two or more medical comorbidities (30). Employment may correlate with unmet healthcare needs because individuals living in poverty while employed (as opposed to receiving government benefits) are likely to be working jobs with unpredictable schedules, heavy consequences for absence, and no insurance benefits (30).

Individuals with homelessness must overcome a unique set of obstacles to adhere to a medication regimen. Challenges may include accessing a facility for regular refills, maintaining a reliable storage site for prescribed drugs, protecting drugs from theft, obtaining privacy for dosing, self-managing one's doses, complying with medication instructions, and remaining engaged with treatment (9, 30, 31, 43, 44). Homeless individuals may not have regular daily schedules and reminders to take medications as prescribed; they may also have limited access to integrated care between their homeless service providers and prescribers; and many experience problems with substance use that may complicate their use and efficacy of psychotropic medications (2, 40, 45). Upon discharge from a psychiatric inpatient unit, homeless patients have less access than housed patients to critical healthcare resources, including case management services and prescription drug coverage, despite time of discharge being an ideal time for providers to arrange healthcare services for homeless patients (46). Nearly 60% of the U.S. homeless population is uninsured (30), which increases the financial burden of treatment and further decreases medication accessibility. A Canadian health care questionnaire found that among homeless men who did not fill a prescription medication, 73% reported non-adherence because of medication cost or lack of drug benefit coverage (43). Individuals who were automatically covered by a federal drug plan through their shelter were significantly less likely to leave prescriptions unfilled (20%, $N = 20$ vs. 6%, $N = 6$) (43). Homeless individuals in the United States similarly cite inability to afford care as the most common reason for unmet healthcare needs (30). This population may further limit healthcare encounters due to perceived discrimination in healthcare settings related to their homeless status (47). Homeless adults also self-report that poor self-management skills, lack of perceived effect, and forgetfulness are significant reasons for non-adherence to psychiatric medication (40). Lack of insight into one's psychiatric condition and the importance of consistent treatment may also contribute to non-adherence. Lastly, mental health care may be neglected as homeless individuals are forced to prioritize more basic needs such as food, shelter, and safety (48).

1.3 Consequences of psychiatric medication non-adherence

The immediate consequence of medication non-adherence is that prescribed medications do not have the intended effects on patients' health conditions. Consequences of non-adherence to psychiatric medications may include exacerbation or recurrence of psychiatric symptoms, further social or occupational impairments, and various other downstream outcomes such as hospitalization, financial instability, homelessness, and criminal justice involvement. Considerable literature has documented the negative consequences of psychiatric medication non-adherence in severe psychiatric conditions like schizophrenia and bipolar disorder (49–52). For example, data from the European Mania in Bipolar Longitudinal Evaluation of Medication (EMBLEM) study, which was a 21-month follow-up study, found that psychiatric medication non-adherence was significantly associated with increased risk of relapse, hospitalization, and suicide attempts (50). Costs incurred by non-adherent patients were significantly higher than those of adherent patients (£10,231 vs. £7,379) mainly due to inpatient costs. Another study estimated the annual inpatient costs of schizophrenia to be about $9 billion (adjusted for inflation) in the United States, with 40% of rehospitalization costs attributed to antipsychotic medication non-adherence (53).

Although there have been very few studies that have examined the consequences of psychiatric medication non-adherence specifically among homeless individuals, one would expect similar or worse consequences than those of stably housed individuals, given the potential negative downstream effects on housing and economic prospects. In one study of over 1,000 homeless or unstably housed adults in three Canadian cities, medication non-adherence was significantly associated with more frequent emergency department visits (three or more visits in a year) (28). Other Canadian studies have found that antipsychotic medication non-adherence is associated with longer lifetime duration of homelessness (2), while treatment adherence is associated with improved housing status as well as improved clinical outcomes for homeless individuals with psychiatric disorders (1). Poor health outcomes associated with psychiatric medication non-adherence may exacerbate the challenge of securing and maintaining housing, especially when the untreated illness involves cognitive impairment. Medication non-adherence is thus an important target for improving outcomes among homeless adults.

1.4 Assessing and reporting medication adherence

There are barriers to assessing the actual impact of interventions to improve medication adherence. Studies that measure adherence during a study may not be generalizable to real-world settings, and studies which rely on administrative records are reliant on documentation of medication adherence which may not always be captured. Further, among the existing research which focuses on medication compliance, "adherence" and "non-adherence" are defined differently between studies, which exacerbates the challenge of synthesizing the existing data. For example, patients are commonly considered "adherent" if they meet or exceed a certain threshold (commonly 80%) of prescribed doses (54, 55). However, studies may alternatively consider a patient "adherent" based on their regularity of dosing, e.g., the patient is adherent if they do not exceed some number of consecutive missed doses. Studies may use their own definition of adherence (sometimes unspecified) to report that a certain percentage of subjects were adherent, non-adherent, or partially adherent. Alternatively, adherence may be reported as a percentage of maximum possible engagement, e.g., a subject or group was 60% adherent if they attended 60% of scheduled treatment sessions. Thus, there is a lack of standardization in the reporting of medication adherence. There is also wide variability in the methods used to assess this adherence and the reliability thereof.

Medication adherence may be assessed using direct or indirect methods. Direct strategies are utilized less frequently because they involve more effort by the provider and the patient, and they are often more expensive than indirect methods (56). For instance, adherence can be monitored by plasma levels, although this is relatively burdensome and expensive. Direct monitoring of drug or drug metabolite concentration is also affected by "white coat adherence," wherein adherence improves in the days before and after an appointment with a provider (57). Directly observed drug administration is the most reliable method of adherence monitoring, but also requires high effort (58). Prescription refill rate is one indirect measure that is widely used to assess adherence among psychiatric populations. Compared to other indirect measures of adherence, prescription refill rate is particularly accurate as it circumvents the Hawthorne effect, while data collection is relatively low effort and low cost (59). Pill counting is also popular, but not necessarily reliable, as pills may be discarded by the patient to give the illusion of adherence. Neither prescription refill rate nor pill counting validate when exactly each dose was taken or that it was taken at all (58). Dose timing can be observed via electronic pillbox monitoring, although this still does not confirm that the patient took the medication and dosed correctly. Electronic monitoring is also expensive to implement, which limits its current use (58). The most cost-effective and common method of assessing medication adherence is self-report by patients (56). However, self-reported adherence may be overestimated due to social desirability bias or recall issues, particularly among psychiatric patients with cognitive deficits (60). Still, the Medication Adherence Rating Scale (MARS) is popular for assessing medication adherence within psychiatric populations and has even been validated for use among homeless people with schizophrenia (61). The Modified Morisky Scale (MMS) has also been used to assess medication adherence among homeless individuals (62). The reliability of self-reported stigmatized behaviors (such as treatment noncompliance) may be improved by using computerized data collection rather than face-to-face interviewing (63).

To our knowledge, there has been no systematic review of interventions targeted specifically to homeless adults with psychiatric disorders. However, there is existing evidence that homeless individuals may be less compliant to interventions addressing medication adherence across conditions. A systematic review and meta-analysis of 771 interventions to address medication non-adherence, in general, across various populations found small effect sizes for interventions overall, and significantly lower effect sizes for interventions that included homeless populations compared to interventions that did not include homeless populations (0.160 vs. 0.292, respectively) (64). The review found that behavioral and habit-based interventions (e.g., rewards, prompts, linking dosing with another activity) were associated with higher adherence, whereas cognitive interventions (e.g., education, attitude improvement) were associated with lower adherence. It was also found that standardized interventions were more successful than individualized interventions. Of the 771 trials, only 17 reported including homeless individuals in the studied sample. The relative effectiveness of those 17 interventions was not reported. Further, psychiatric populations were not a focus of the review. The unique psychosocial, economic, and medical issues faced by homeless individuals with psychiatric conditions may require a more tailored approach to improving medication adherence. A synthesis of the literature may inform researchers and clinicians working with homeless populations and advise program administrators on effective ways to support homeless individuals in their recovery.

2 Methods

We conducted a systematic review of the literature on medication non-adherence among people with homelessness and psychiatric disorders with the assistance of the software Covidence. PRISMA guidelines for systematic reviews were followed, with some exceptions based on the quality of included studies and the specificity of available data (e.g., effect estimates were not calculated for each study). Databases searched included MEDLINE, Embase, PsychInfo, Scopus, Web of Science, CDSR, and CENTRAL. The search encompassed records up to August 11, 2022, with no lower limit. Search terminology included terms on homelessness, treatment adherence, and psychiatric disorders (see Supplementary Appendix 1). After excluding duplicate records, 664 studies were screened for the following criteria: (1) published in English, (2) published in a peer-reviewed journal, (3) including a healthcare intervention for adults with homelessness and psychiatric disorders, and (4) reporting quantitative data on psychiatric medication adherence such as: (a) pre- and post-intervention medication adherence, (b) between-group difference in medication adherence where groups receive different interventions, and (c) adherence level significantly different from established estimates for the population. Two authors screened titles and abstracts, and a third author resolved conflicts. After excluding 609 studies, two authors conducted a full-text assessment of 55 remaining studies using the same eligibility criteria. We identified 11 records that met criteria for inclusion. The search strategy is displayed in Figure 1.

We developed a scale consisting of five categories to rate the relative effectiveness of diverse strategies to improve medication adherence in this population as described in each study in the review. Each strategy that improved medication adherence was rated on a 5-point scale depending on whether it met each of the 5 items as reported in the study, which were: (1) At least 80% medication adherence was achieved; (2) Medication adherence improved by at least 50%; (3) Study was a randomized controlled trial; (4) Sample size was at least 30; and (5) Adherence was assessed at least 6 months post-intervention initiation. Studies which reported increased medication adherence and reported sufficient information to assess each of the five items were given a score out of five. Studies that did not report sufficient information to score one or more items were not assessed for relative effectiveness. The nature of items 1 and 2 (adherence level achieved and overall improvement) varied based on each study's design and definition of adherence. For example, interventions could meet criteria for item 1 ("At least 80% adherence was achieved") if at least 80% of the sample was deemed "adherent" post-intervention or if the average post-intervention medication possession ratio (MPR) was at least 0.8. Item 1 was incorporated because taking 80% of prescribed doses is a common threshold for medication therapeutic efficacy, and therefore it is a target adherence rate for individuals with homelessness and psychiatric disorders. When assessing item 2 ("Adherence improved by at least 50%"), improvement was calculated as a proportion of the sample's baseline or control group adherence, e.g., if the sample's mean MPR was 0.4 at baseline and 0.6 post-intervention, then adherence improved by 50%.

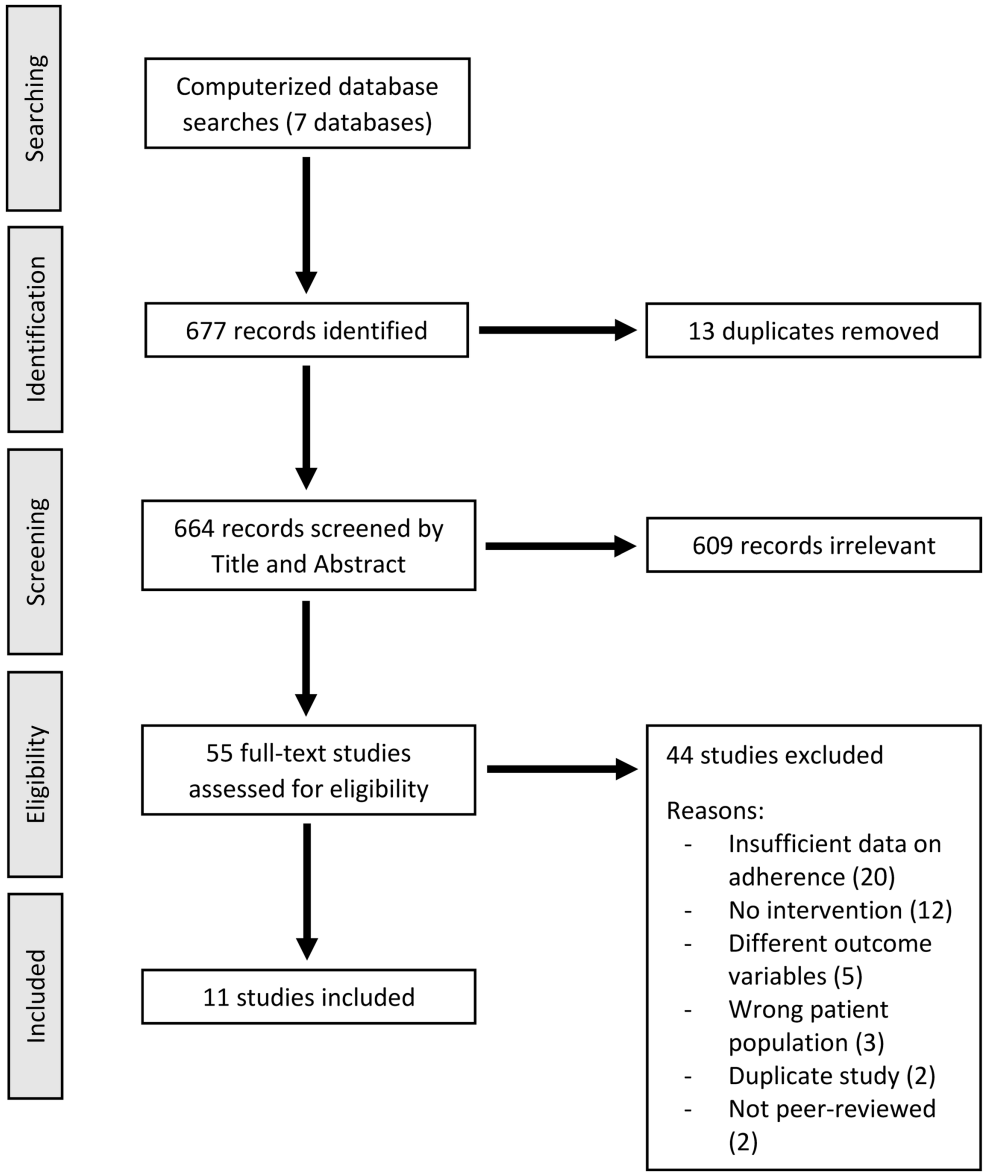

FIGURE 1
Flowchart of search strategy.

3 Results

This review identified a total of 11 studies which comprised seven different strategies to address medication non-adherence among people experiencing homelessness and psychiatric disorders (Table 1). Studies were conducted in the United States (eight interventions), Canada (two interventions), and England (one intervention). There were six studies in outpatient settings (four interventions), three studies in residential settings (two interventions), one study in a shelter setting (one intervention), and one study in an inpatient setting (one intervention). Of the 11 total studies, there were three randomized controlled trials (RCTs) and the remaining studies were observational studies. Across studies, sample sizes ranged from $N = 10$ to $N = 165$ (mean $N = 75$, median $N = 52$). Studies were published between 1997 and 2020. There was wide variability in adherence assessment method, definition of adherence, and reporting style for adherence data. The strategies used to improve medication adherence can be broadly divided based on location of care into (A) outpatient treatment strategies and (B) residential/shelter-based/inpatient treatment strategies.

Nine of eleven studies reported increased adherence. Positive adherence outcomes were associated with all four outpatient interventions, including: Assertive Community Treatment (ACT), Cell Phone-Assisted Monitoring, Customized Adherence Enhancement (CAE) plus Long-Acting Injectable (LAI) Medications, and Homeless-Designated Pharmacy Clinics. Two outpatient interventions, CAE plus LAI Medications and Homeless-Designated Pharmacy Clinics, were each supported by two studies. The two other outpatient interventions were each examined in one study. Among residential, shelter-based, and inpatient strategies, mixed adherence outcomes were associated with two out of three interventions: use of the Housing First model and Modified Therapeutic Communities.

TABLE 1 Strategies to address medication non-adherence among people with homelessness and psychiatric disorders.

Intervention	Study	Setting	Study design	Comparison	Psychiatric population	Sample size	Duration of intervention	Adherence assessment method	Results	Description of results	Quality of study (score on 5-Item Scale)
Assertive Community Treatment	(65)	Outpatient	Randomized controlled study	Within-subjects	Severe and persistent mental illness	77[1]	1 year	Psychiatrists' assessment	Increased medication adherence	Proportion of clients adherent increased from 29% at baseline to 57% at 3 months	Between-subjects adherence data was not reported (Score = 4)
Cell Phone-Assisted Monitoring	(66)	Outpatient	Non-randomized uncontrolled study	None	Comorbid Axis I and substance use disorder	10	1 month	Self-report	Increased medication adherence likely	93% of doses were taken	No comparison group or baseline data; Results rely on self-report; Adherence was measured short-term (30 days) (Score = N/A)
Customized Adherence Enhancement plus Long-Acting Injectable Antipsychotics	(67)	Outpatient	Non-randomized uncontrolled study	Within-subjects	Schizophrenia or schizoaffective disorder	30[2]	6 months	Self-report (Tablets Routine Questionnaire)	Increased medication adherence	Mean missed doses decreased from 46% at enrollment to 10% at 6 months	Results rely on self-report (Score = 3)
Customized Adherence Enhancement plus Long-Acting Injectable Antipsychotics	(68)	Outpatient	Non-randomized uncontrolled study	Within-subjects	Schizophrenia or schizoaffective disorder	30[3]	6 months	Self-report (Tablets Routine Questionnaire)	Increased medication adherence	Mean missed doses decreased from 49% at enrollment to 15% at 6 months	Results rely on self-report (Score = 3)
Homeless-Designated Pharmacy Clinic	(69)	Outpatient	Non-randomized uncontrolled study	Within-subjects	Veterans prescribed psychotropic medications	52[4]	1–2 visits (each 5–30 min)	Medication possession ratio	Increased medication adherence	Mean medication possession ratio increased from 46.6 to 60.7% at 30 days pre- vs. post- intervention	Adherence was measured short-term (30 days post-intervention) (Score = 0)
Homeless-Designated Pharmacy Clinic	(70)	Outpatient	Non-randomized uncontrolled study	Within-subjects	Veterans prescribed mental health medications	21	1–2 visits (each 30 min)	Not specified	Increased medication adherence	Of 18 veterans with noncompliance, 5 (28%) improved adherence	Adherence assessment method was not specified; Degree of improvement was not specified; Timepoint of assessment was not specified (Score = N/A)

(Continued)

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TABLE 1 (Continued)

Intervention	Study	Setting	Study design	Comparison	Psychiatric population	Sample size	Duration of intervention	Adherence assessment method	Results	Description of results	Quality of study (score on 5-Item Scale)
Housing First with Assertive Community Treatment or Other Health and Social Services	(71)	Residential	Randomized controlled study	Between-subjects	Opioid dependence and mental illness	97	2.8 years	Medication possession ratio	No difference in medication adherence	No significant difference in mean medication possession ratio	(Score = N/A)
Housing First with Assertive Community Treatment or Other Health and Social Services	(72)	Residential	Randomized controlled study	Between-subjects	Schizophrenia	165	2.6 years	Medication possession ratio	Increased medication adherence	Higher medication possession ratio in scattered-site housing with Assertive Community Treatment (0.78) compared to congregate housing (0.61) and control group (0.55)	(Score = 3)
Therapeutic Community, Modified for Homelessness Prevention	(73)	Residential	Non-randomized, non-equivalent controlled study	Between-subjects	Mothers with substance abuse	148[5]	1 year	Not specified	No difference in medication adherence	No significant difference in medication adherence between modified and standard Therapeutic Communities	Respective levels of adherence were not specified; Control was standard Therapeutic Community, not treatment as usual
Therapeutic Community, Modified for Homeless Persons with Co-occurring Disorders	(74)	Shelter-based	Retrospective controlled study	Between-subjects	Comorbid substance use disorders and mental illness	140	8.3 months (mean for veteran subset)	Case records	Increased medication adherence	Lower proportion of subjects nonadherent in Modified Therapeutic Community (18.6%) vs. control group (35.3%)	Definitions of adherence, partial adherence, and non-adherence were not specified (Score = 2)
Homeless-Designated Inpatient Facility	(75)	Inpatient	Non-randomized controlled study	Between-subjects	Mental illness	50[6]	5.8 months (mean)	Care coordinators' assessment (Rating of Medication Influences)	Increased medication adherence likely	Higher proportion of experimental group improved medication noncompliance influences (95% vs. 46%)	Assessed medication adherence indirectly (Score = N/A)

[1]$N = 72$ subjects assessed for medication adherence. [2]$N = 10$ subjects assessed for concomitant oral medication adherence. [3]$N = 15$ subjects assessed for concomitant oral medication adherence. [4]$N = 17$ subjects assessed for medication adherence. [5]$N = 49$ subjects assessed for medication adherence. [6]$N = 32$ subjects assessed for medication adherence.

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Each of these interventions was examined in two studies. Positive adherence outcomes were associated with a Homeless-Designated Inpatient Facility, which was examined in one study.

3.1 Outpatient treatment strategies

3.1.1 Assertive Community Treatment

One RCT study of Assertive Community Treatment (ACT) (65) met the inclusion criteria of this review. The ACT model is a strong evidence-based model of care for adults with psychiatric disorders including those experiencing homelessness (76–78). Clients are engaged in team-based treatment, which is focused on helping clients to (1) acquire material resources (food, shelter, etc.); (2) develop community-life coping skills (using public transport, budgeting money, etc.); (3) remain motivated to persevere; and (4) develop greater autonomy (77). ACT also involves supporting and educating non-patient community members to better relate to patients. All aspects of this treatment model are "assertively" promoted to minimize dropout. Program administrators and evaluators have reported increased levels of medication adherence among homeless people with psychiatric disorders engaged in ACT (79). Dixon et al. examined medication adherence among homeless individuals ($N=77$) with severe and persistent psychiatric disorders (schizophrenia, major affective disorder, or primary substance use disorder) engaged in ACT or usual community services (65). In the experimental group, percentage of patients who were medication adherent nearly doubled (from 29 to 57%) between baseline and 3 months of ACT. Adherence remained similarly high 1 year after baseline (65). Subjects were deemed non-adherent, intermittently adherent, or adherent at each three-month evaluation point. If subjects missed doses for more than seven consecutive days or refused psychotropic medication suggested by a psychiatrist, they were deemed non-adherent. Frequency of non-consecutive missed doses was also taken into account. Program psychiatrists used a variety of factors to assess for non-adherence, including hospital records, pill counts, blood levels, reports from the patient, and input from their clinicians, family members, and community supports.

3.1.2 Cell Phone-Assisted Monitoring

One non-randomized uncontrolled pilot study on Cell Phone-Assisted Monitoring of medication adherence (66) met inclusion criteria. An automated, cell phone-based medication monitoring system was identified as a feasible method of monitoring psychiatric medication adherence for homeless patients (66). Ten homeless individuals with comorbid psychiatric disorders and substance abuse were enrolled in a 30-day pilot study wherein they received automated daily phone calls to assess medication adherence (66). Participants were reachable 93% of the time and self-reported 100% adherence when reached. Baseline adherence was not measured, and adherence was not verified with additional methods. Over the 30-day trial, all phones were retained by participants and there were no dropouts. Upon study exit, participants reported that the automated system reminded them to medicate and added structure to their day (66).

3.1.3 Customized Adherence Enhancement plus Long-Acting Injectable Antipsychotics

This review identified two studies which implemented a long-acting injectable (LAI) intervention for homeless individuals, both of which combined LAI antipsychotics with Customized Adherence Enhancement (CAE) and utilized a non-randomized uncontrolled study design (67, 68). An earlier study found that switching veterans from oral to LAI antipsychotics was associated with fewer inpatient psychiatric admissions and shorter inpatient stays (80). Sajatovic et al. found that concomitant LAI antipsychotic treatment with haloperidol decanoate resulted in increased adherence to oral non-antipsychotic psychotropic medications after 6 months among homeless individuals with psychotic disorders ($N=30$) (67). Participants in this study received monthly CAE in addition to the monthly LAI. CAE included medication-related psychoeducation (developing medication routines, communicating medication burdens with providers, managing adherence, etc.). In a subset of 10 subjects who were prescribed non-antipsychotic oral psychotropic medications, missed doses (past month) of prescribed oral psychotropics decreased from 46.1% at study enrollment to 10.1% at study end. Missed doses were assessed by self-report (modified Tablets Routine Questionnaire). The combined CAE and LAI treatment also improved psychiatric symptoms and functioning in the homeless adults studied (67). A second six-month CAE plus LAI antipsychotic study with similar structure found that concomitant LAI paliperidone palmitate improved adherence to oral prescribed drugs among homeless individuals with psychotic disorders ($N=30$) (68). In a subset of 15 subjects, missed doses (past month) of oral prescribed drugs decreased from 48.7% at enrollment to 15.2% at study end based on self-report (Tablets Routine Questionnaire) (68).

3.1.4 Homeless-Designated Pharmacy Clinics

Two Homeless-Designated Pharmacy Clinic interventions were included in this review, and both used a non-randomized uncontrolled study design (69, 70). The US Department of Veterans Affairs has created a Homeless Patient Aligned Care Team (H-PACT), a treatment model to help provide primary care to homeless veterans (81). In one study, a pharmacy resident clinic was established at a day center for homeless veterans, partially to support the need for local H-PACT implementation (69). This walk-in clinic was open one half-day per week. A psychiatric pharmacy resident met with veterans to review medications, provide medication counseling and other education, discuss patient concerns, and implement related interventions, among other services. Visits lasted 5–30 min. Over 18 clinic days, 52 veterans attended the clinic and 17 of those veterans were prescribed psychotropic medications. Following engagement with the clinic, average psychotropic medication adherence increased from 46.6 to 60.7%. Adherence was assessed by MPR 30 days prior to and 30 days after the veteran's pharmacy clinic visit. A second study described adding a mental health pharmacy resident clinic within H-PACT at one location to improve mental health access for its patients (70). The pharmacy resident clinic evaluated veterans during 30-min in-person visits. Veterans were provided with medication adherence education as well as other medication-related services (reduction in polypharmacy, identifying administration errors, regimen adjustments, referrals, etc.). In total, 21 veterans received pharmacotherapy assessment at the clinic, 18 were noncompliant to some extent, and 5 improved adherence following service engagement. The study's assessment strategy for adherence was not specified, nor was the degree of improvement or the timepoint of follow-up.

3.2 Residential/shelter-based/inpatient treatment strategies

3.2.1 Housing first

Two randomized controlled Housing First studies met the inclusion criteria of this review, with mixed results for adherence improvement (71, 72). Given the varied challenges faced by homeless individuals receiving psychiatric treatment, Housing First is a prominent strategy to improving outcomes (82, 83). When the basic need of stable housing is secured, patients may prioritize secondary needs like psychiatric treatment. In this model, housing is not contingent on treatment or abstinence. One study assigned opioid-dependent homeless adults with psychiatric disorders ($N = 97$) to Housing First or treatment-as-usual and found that Housing First did not increase adherence to methadone maintenance treatment (71). Housing First group participants were assigned to one of three types of housing based on need assessment, including (1) participant's choice of market rental apartment plus ACT, (2) participant's choice of market rental apartment plus intensive case management with referrals to community services, and (3) study-specific building with private living quarters, some shared amenities (kitchen and dining room), and 24/7 on-site health service providers. Difference in adherence between the three Housing First groups, if any, was not reported. Adherence was based on MPR, which was calculated from methadone dispensation data. In the post-randomization period, mean MPR was 0.52 for Housing First and 0.57 for controls, with no statistically significant between-subjects difference. A second Housing First RCT study found that Housing First increased adherence to antipsychotics among formerly homeless individuals with schizophrenia ($N = 165$) when randomized to scattered-site market rentals with ACT (72). In a randomized controlled trial, participants were assigned to treatment-as-usual or one of two Housing First groups: congregate Housing First wherein clients were assigned single-occupancy units in a shared building with on-site supports or scattered-site Housing First wherein clients chose a single-occupancy market rental and were engaged in ACT. MPR was used to assess adherence. The congregate Housing First group exhibited very low adherence in the post-randomization period (mean MPR 0.61), with levels similar to the treatment-as-usual group (mean MPR 0.55). Significantly higher antipsychotic medication adherence was observed in the scattered-site Housing First plus ACT group (mean MPR 0.78) (72).

3.2.2 Therapeutic communities

One non-randomized non-equivalent controlled study on Modified Therapeutic Community (73) met criteria for inclusion. The Therapeutic Community model, originally developed for the treatment of substance abuse, facilitates overall lifestyle changes (psychological, medical, social, legal, etc.) in support of recovery (74). Residential Therapeutic Communities have been shown to decrease substance use and improve psychological functioning. Many modifications of the Therapeutic Community exist to serve different patient populations. One study examined the effects of a Modified Therapeutic Community (MTC) for homeless mothers with substance abuse in comparison to a standard Therapeutic Community (73). Modifications in the experimental MTC program addressed needs related to family stabilization and homelessness prevention. The experimental group ($N = 77$) included two MTC programs and the control group ($N = 71$) included two standard residential Therapeutic Community programs, with statistical control adjusting for between-group differences. Medication adherence was assessed as part of a greater "Health" domain for each participant, which also included self-help group attendance and amount of help received in understanding medications. Eight of ten items in the "Health" domain were improved in the experimental MTC group, but the exact difference in self-help group attendance and medication adherence was not specified, and the between-group difference in these factors was not statistically significant (73).

A second Modified Therapeutic Community study used a retrospective controlled design (74). The study investigated the effects of a shelter-based Therapeutic Community, modified to address the needs of homeless people with co-occurring substance use disorders and psychiatric disorders (74). Modifications included shortening the duration of activities and meetings, presenting clinical information in smaller units with increased discussion, more hands-on assistance from staff, and more individual counseling. Emphasis was placed on understanding one's psychiatric illness and avoiding relapse triggers. The quasi-experimental study utilized a comparison group of homeless veterans with co-occurring disorders in a general shelter without Therapeutic Community. The MTC group was mostly comprised of non-veterans, with a subset of veterans. Each subject was deemed adherent, partially adherent, or non-adherent, although we were unable to determine exactly how the study defined each. Based on a retrospective review, the control group was significantly more non-adherent, with 35.3% of residents no-adherent in the general shelter without Therapeutic Community ($N = 70$) and 18.6% non-adherent in the MTC shelter ($N = 70$) (74). Adherence and partial adherence were reported only for the veteran subset. The proportion of veterans fully and partially adherent was higher in the experimental MTC than in the control group (60.0% fully adherent and 28.0% partially adherent in the MTC vs. 55.9% fully adherent and 8.8% partially adherent in the control group) (74).

3.2.3 Homeless-Designated Inpatient Facility

One non-randomized controlled study examining the effectiveness of a Homeless-Designated Inpatient Facility (75) met inclusion criteria for this review. Previous research has demonstrated that patients with schizophrenia improve medication adherence following inpatient hospitalization (84). One study evaluated the effect of admission to a homeless-designated inpatient ward on various outcome measures among homeless patients with psychiatric disorders (75). Control patients ($N = 21$) were admitted to standard inpatient units, while the experimental group ($N = 29$) was admitted to a homeless-designated unit that also included enhanced coordination of discharge planning (75). Average length of stay was 177 days for the experimental group and 105 days for the control group. At baseline, factors influencing medication adherence were evaluated using the Rating of Medication Influences (ROMI) (85), which identifies influencing factors of medication compliance and noncompliance separately. Ratings were repeated by care coordinators at 12 months post-discharge for 32 participants. Experimental group participants were more likely to demonstrate improvement on medication noncompliance influences (95% of experimental group vs. 46% of control group) (75). The groups were equally likely to improve on compliance influences. Medication adherence was not measured directly in this study.

3.3 Rating of effectiveness of different strategies

Using our 5-item scale of effectiveness of strategies to improve medication adherence in this population, we scored the studies included in this review (Table 1). However, three of the nine studies in the review which reported increased medication adherence were missing information for one or more items so they could not be scored. The Cell Phone-Assisted Monitoring pilot study (66) reported the highest medication adherence rate (mean 93%) but did not utilize a comparison group or measure baseline adherence to assess improvement. One Homeless-Designated Pharmacy Clinic study (70) reported that 28% of clients improved medication adherence but did not specify the nature of this improvement. The Homeless-Designated Inpatient Facility intervention utilized scales related to medication adherence, but adherence itself was not measured.

4 Discussion

Medication non-adherence is a well-documented and widely known problem among people experiencing homelessness and psychiatric disorders. The effectiveness of interventions targeting medication adherence in this population has not been systematically examined to date. The results of this systematic review show that effective, RCT-supported strategies to improve medication adherence among homeless individuals with psychiatric disorders include Assertive Community Treatment (ACT) and Housing First. Non-RCT studies support the effectiveness of long-acting injectable antipsychotics combined with Customized Adherence Enhancement (CAE plus LAI), Therapeutic Community, and Homeless-Designated Pharmacy Clinics, although further validation in RCTs is warranted.

Of the nine interventions with positive adherence outcomes, ACT was the most effective intervention. After 3 months of ACT, the proportion of homeless subjects with psychiatric disorders who were adherent to medication increased substantially (from 29% adherent at baseline to 57% adherent at 3 months) and remained at a similar level 1 year after baseline (65). This study was an RCT that assessed medication adherence in 72 subjects. A previous meta-analysis (86) reported that ACT reduces homelessness and psychiatric symptom severity in individuals experiencing homelessness and psychiatric disorders; positive outcomes may be due in part to increased psychiatric medication adherence. It is important to recognize that some critics have pointed to ACT being coercive or too "paternal," but there are ways to structure ACT and to build a team culture that is recovery-oriented in serving homeless populations (87). In addition, Housing First interventions, which were included in this review and are client-centered, often use an ACT-like model for case management and demonstrate how these models might be effectively used within a recovery-oriented framework.

Long-acting injectable antipsychotics combined with Customized Adherence Enhancement (CAE plus LAI) (67, 68) achieved high rates of adherence (mean 89.9 and 84.8% of doses were taken, respectively) at 6 months post-intervention initiation. LAI antipsychotic medications were initiated as a component of these interventions; the reported adherence improvements refer to concomitant oral psychotropic medications. CAE plus LAI Medication appears to be a promising strategy to improve oral psychiatric medication adherence among homeless individuals with schizophrenia. Future studies would benefit from larger sample sizes and RCT design.

A Housing First intervention (72) was associated with significant improvement in adherence (mean MPR 0.78, 41.8% improvement in adherence). The study included a scattered-site housing group, which had higher medication adherence than the congregate housing group. ACT was incorporated into the scattered-site Housing First intervention. The study was a well-powered RCT with an adequate sample size ($N = 165$) and a long-term adherence measurement (mean follow-up time was 2.6 years). Providing homeless individuals with supported housing may be a promising strategy to improve medication adherence. But a second Housing First RCT study in this review (71) which used a smaller sample size did not report significantly improved medication adherence. The two Housing First studies differed in psychiatric population and the associated medication type on which adherence was based. Improved adherence was reported for homeless adults with schizophrenia taking antipsychotic medication (72), but adherence improvement was not reported for homeless adults with opioid dependence and psychiatric disorders taking methadone (71). The additional challenges faced by dual-diagnosed homeless individuals may contribute to smaller improvement from interventions like Housing First. Other factors that may contribute to adherence improvement are the type of housing provided (e.g., market rentals or program-specific housing), the desirability thereof, and the intensity of bundled health services. The provision of market-based, single-occupancy apartments was associated with improved medication adherence whereas more communal housing (a study-designated building with single-occupancy rooms, communal meals, and on-site supports) was not associated with improved adherence despite there being no significant difference in demographics or pre-randomization adherence between groups (72). A previous multisite study analysis found that homeless clients in substance abuse treatment significantly increase retention when housing is provided, but that retention may suffer when housing is provided alongside less desirable high-intensity services (88). It may be useful to examine adherence improvement among homeless adults with psychiatric disorders when Housing First is combined with supportive services of different intensities.

Non-RCT studies focused on the homeless population with psychiatric disorders include Therapeutic Community and Homeless-Designated Pharmacy Clinics. A Therapeutic Community modified for homeless individuals with comorbid substance use disorders and psychiatric disorders (74) reported modest improvement in adherence compared to other interventions (25.8% improvement in proportion of sample adherent and partially adherent). The study used a retrospective controlled design, although it was of an adequate sample size ($N = 140$) and included long-term assessment of medication adherence (mean length of stay was 8.3 months in the veteran subset). A Homeless-Designated Pharmacy Clinic study (69) reported that mean adherence improved from 46.6 to 60.7% in a small subset of veterans ($N = 17$). A non-RCT design was used, and adherence was measured 30 days post-intervention. This pharmacy clinic was the shortest intervention to report significant adherence improvement, with clinic visits lasting a maximum of 30 min and most veterans attending only one visit.

RCTs of interventions involving telehealth and incentivized programs to increase medication adherence are needed. Given the increasing utilization of telehealth services and patients' increasing comfort with mobile devices, cell phone-assisted medication adherence strategies warrant further exploration. Forgetfulness as a factor of non-adherence may be reduced by automated reminders. Further, habit-based and behavioral-focused interventions have shown to be more successful at improving adherence than cognitive-based interventions in the general population (64); this finding may be extended to homeless individuals with psychiatric disorders, who may especially benefit from increased daily regimentation. To implement a telehealth intervention, homeless patients must be provided with mobile devices and a service plan, but the strategy otherwise requires relatively little ongoing effort or financial investment. While electronically self-reported adherence may be exaggerated, patients may also be more honest about stigmatized behaviors (e.g., medication noncompliance) with computerized systems than with providers in-person (63). This review included one pilot telehealth study on Cell Phone-Assisted Monitoring of daily medication adherence (66) wherein subjects retained the provided cell phones, appreciated that automated calls added structure to their day, and reported very high medication adherence (mean 93% of doses were taken). Further study is necessary to determine the effectiveness of Cell Phone-Assisted Monitoring in this population long-term. It would be useful to validate electronically self-reported adherence using pharmacy records or other methods. Further study is also needed on interventions utilizing financial incentives to increase medication adherence among homeless adults with psychiatric disorders. A previous meta-analysis (89) found that incentivized programs significantly increase medication adherence in individuals with psychiatric disorders, and a previous scoping review (90) found that financial incentives may improve engagement and retention in health services for homeless adults. This review did not include incentivized interventions. Also conspicuous by their absence are studies that incorporate cognitive remediation and vocational rehabilitation strategies.

The conclusions of our systematic review need to be viewed in the context of its limitations. This review focuses on challenges surrounding homelessness primarily in the United States, and nine of twelve studies included in this review were conducted in the United States. Further, there is a very limited number of studies which fit the search criteria of this review. Medication adherence was often not the primary outcome variable in these studies, so adherence data was accompanied by minimal or no statistical analysis in many cases. We also found that in studies reporting medication adherence following an intervention, baseline adherence was often not assessed or not reported. Given the small number of studies in this review, we were also hesitant to distinguish between medication-assisted addiction treatments (e.g., opioid replacement therapy) and other psychotropic medications. The strategies best suited to enhancing medication adherence may vary based on the psychiatric condition under treatment and the presence of comorbidities. Among the studies included in this review, medication adherence was measured using different strategies and reported with varying levels of specificity. As a result, it is challenging to directly compare the effectiveness of these interventions, such as through a meta-analysis. More research is needed on additional strategies to improve medication adherence in this population, including telehealth and incentivized programs. It would also be beneficial to analyze existing strategies separately, as they are often combined for therapeutic effect, e.g., Customized Adherence Enhancement plus Long-Acting Injectable Medication. Among the existing intervention studies targeting medication adherence in people with psychiatric disorders experiencing homelessness, there are few randomized controlled trials.

5 Conclusion

Among the interventions included in this systematic review, the interventions with the strongest evidence for improving medication adherence among individuals with psychiatric disorders experiencing homelessness were Assertive Community Treatment, Customized Adherence Enhancement plus Long-Acting Injectable Medication, and Housing First. Smaller, non-randomized, and/or uncontrolled trials of Cell Phone-Assisted Monitoring, Homeless-Designated Pharmacy Clinics, Therapeutic Community, and Homeless-Designated Inpatient Care also showed improved adherence. Given the importance of medication adherence in this population, additional adequately powered randomized controlled trials examining medication adherence improvement strategies are warranted.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

RH: Writing – original draft, Writing – review & editing. RR: Writing – original draft, Writing – review & editing. JT: Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

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Executive function and adult homelessness, true impairment or frontal lobology?

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Homelessness is associated with multiple risk factors for neurocognitive impairment. Past research with people experiencing homelessness has described "frontal lobe" dysfunction including behavioral disorders and executive cognitive impairments. In the current study, 72 adults experiencing homelessness were assessed with a standardized assessment of executive function, and interviewed regarding neurological and psychiatric history. When compared to a control sample of 25 never-homeless participants, and controlling for level of education, there was little evidence for executive dysfunction in the sample of people experiencing homelessness. Levels of substance abuse, past head injury, and post-traumatic stress disorder were notably high. However, there were no statistically significant associations between cognitive task performance and clinical or substance abuse variables. Gambling was surprisingly infrequent, but risk-taking behavior among intravenous drug users was common. Though in neither case was it linked to executive function. Overall, there was little evidence for executive impairment in this sample of people experiencing homelessness. I suggest that past research has often used inappropriate criteria for "normal" performance, particularly comparing people experiencing homelessness to control data of relatively high education level. This has led to elements of "frontal lobology," that is, clinical neuroscience research that tends to overly link non-typical or pathological behavior to frontal lobe impairment. When appropriate comparisons are made, controlling for education level, as in this study, associations between executive function impairments and adult homelessness may be weaker than previously reported.

KEYWORDS

homelessness, cognitive function, executive function, education, socioeconomic deprivation, frontal lobe function, addictive behaviors

1 Introduction

Homelessness has become a substantial social and medical issue in most, if not all, developed countries, despite numerous health and social welfare services aimed at reducing its prevalence and impact (Tsai et al., 2017). There is ample clinical reason to suspect cognitive disorders would be overrepresented in populations of people experiencing homelessness. Adults experiencing homelessness report substantially raised levels of

childhood abuse (Pluck et al., 2013), being victims of violence (Heerde et al., 2014), traumatic brain injury (Stubbs et al., 2020), substance abuse (Gutwinski et al., 2021), and psychotic illness (Ayano et al., 2019) which is often unmedicated (Rangu et al., 2022), amongst multiple other factors likely to impact neurocognitive functioning.

In addition to a body of literature on general neurocognitive disorder (e.g., dementia), there are multiple studies investigating focal impairments. Research on neurocognitive function of adolescents and adults experiencing homelessness has particularly focused on functions of the "frontal lobe," despite using only behavioral measures (e.g., Pluck et al., 2015, 2018), sometimes to the extent of including the expression "frontal-lobe" or "prefrontal" in the article title, (e.g., Davidson et al., 2014; Rogoz and Burke, 2016).

Other research has reported behavioral alterations and semiology to suggest frontal lobe dysfunction in people experiencing homeless, such as neurological soft signs, disinhibition, apathy and risk-taking behavior (Douyon et al., 1998; Pluck et al., 2011; Piche et al., 2018). Top-down cognitive control, aka executive functions, abilities frequently linked to the frontal lobes (Pluck et al., 2023), have also been linked to adult homelessness (Davidson et al., 2014; Saperstein et al., 2014; Stergiopoulos et al., 2015; Hurstak et al., 2017; Fry et al., 2020; Gicas et al., 2023). Review papers have noted that, at the group level, cognitive performance of people experiencing homelessness is almost universally lower than would be expected from the general population. Furthermore, they have linked the observed impairments on executive function tests to frontal lobe disorder (e.g., Spence et al., 2004; Stone et al., 2019; Fry et al., 2020).

Several authors have suggested that frontal-lobe linked executive impairments may be contributing factors to homelessness at the individual level (Spence et al., 2004; Davidson et al., 2014; Saperstein et al., 2014; Sharma et al., 2022). Spence et al. (2004) speculated that executive control, which they linked to frontal lobe impairments, would be needed for individuals experiencing homelessness to improve their circumstances and break out of destructive behaviors. Similarly, Davidson et al. (2014) argued that the executive impairments that they observed, which they considered to be signs of prefrontal impairment, confound attempts at rehabilitation and social care of people experiencing homelessness due to potential for disadvantageous behaviors. Saperstein et al. (2014) suggested low scores on tests of executive function were predictive of inability of people experiencing homelessness to earn a wage sufficient for independent living.

This may all appear to implicate the frontal lobes in the causes and maintenance of adult homelessness. However, another way to interpret this is in what David (1992) named "frontal lobology," that is, the tendency to link any behavior seen as non-typical or pathological to the frontal lobes of the brain. Although coined over 30 years ago, the reductionist tendency to associate complex behavioral issues with the frontal lobes remains a common phenomenon in clinical sciences dealing with the brain.

So, what else could mimic frontal-lobe impairment? An important factor is socioeconomic background, and the very closely linked issue of educational experience. Homelessness-experiencing adults are very likely to have been raised in conditions of low socioeconomic status (Koegel et al., 1995; Benjaminsen, 2016) and multiple studies have reported relatively low education levels among homelessness-experiencing populations (Fry et al., 2020; Pluck et al., 2020; Chevreau et al., 2023). This is important because neuropsychological tests of frontal-lobe behavioral traits and executive function measures are substantially affected by education, and socioeconomic background in general (Grace and Malloy, 2001; Spinella et al., 2007; Pluck et al., 2021; Pluck, 2022).

It is possible that the relatively low performance on tests of executive function, observed in multiple studies with samples of homelessness-experiencing people, is simply reflecting their socioeconomic background, rather than frontal-lobe pathology. In the current study I examined performance of adults experiencing homelessness on one of the most commonly used assessments of executive function, and a test often described as a "frontal lobe" test, the Wisconsin Card Sorting Test (WCST). However, also included are a control group matched for demographic factors. It is hypothesized that there will be no difference in task performance between homelessness-experiencing and never-homeless individuals, when education level is accounted for.

2 Method

2.1 Participants

Seventy-two homelessness-experiencing adults were recruited for the study from hostels and other services for homeless individuals in the city of Sheffield, UK. All were currently homeless based on a three criteria definition, (i) accessing services for people experiencing homelessness, (ii) lacking a permanent tenancy, and (iii) self-describing as homeless. A control group of 25 participants was recruited in the same city, with an exclusion criterion that participants had ever been homeless. An attempt was made to recruit control participants with relatively low education, as a match to the homelessness-experiencing group. Advertisements for participants in the control group were placed in community centers and welfare offices.

2.2 Materials

Clinical background focusing on neurological and psychiatric disorders was taken. It was not possible to consult medical notes, instead I relied on self-report. However, questions were mainly on whether the participant had ever been diagnosed with, or told by a doctor that they had, a particular disorder (regardless of whether they believed it). Interviews were performed orally, and follow-up questions were used to clarify any ambiguous responses, in an attempt to improve accuracy of the self-reports. For head injury, participants were asked if they had ever received a blow to the head that resulted in loss of consciousness for more than 30 s.

Detailed substance abuse histories were taken on past month, past year, and lifetime use for: cannabis, crack cocaine, powder cocaine, heroin, other opiates, benzodiazepines (obtained illicitly), amphetamines, ecstasy, hallucinogens, and solvents. They were also asked about intravenous drug use using the six drug-use items in the HIV Risk-Taking Behavior Scale (Darke et al., 1991). Problem alcohol use was measured with the Alcohol Use Disorders Identification Test (Saunders et al., 1993). On that scale, scored over the past 12 months, scores of 8 or greater indicate at

least hazardous or harmful drinking. Pathological gambling was measured using the Gambling Inventory (Ricketts and Bliss, 2003). This also provides a classification for probable gambling based on the previous 12 months. It can be used with DSM-V criteria, in which case a probable addictive disorder would be identified with scores of 4 or more.

Clinical disorders and substance abuse were not exclusion criteria in the homelessness-experiencing group, as such disorders are so common that exclusion of individuals would produce a sample very unrepresentative of actual homeless populations. However, they were for the control sample. To measure education level of all participants, we calculated the total number of years spent in full-time formal education.

Cognitive function was assessed with the Wisconsin Card Sorting Test 64 (WCST). This standardized version of the classic test involves participants sorting each of a set of 64 cards into one of four categories, based on key cards that are provided (Kongs et al., 2000). Multiple scores can be derived from performance on the WCST, but the total number of categories achieved has the best psychometric properties in terms of reliability (Kopp et al., 2021) and validity for detecting impaired performance (Lange et al., 2018). The maximum number of possible categories achieved is 6 (higher scores indicate better performance). Normative data is available from a USA-based sample.

2.3 Procedure

All participants provided written informed consent, in accordance with the ethics committee approved protocol. All of the control group and some of the homelessness-experiencing participants (e.g., those who were experiencing rooflessness) were interviewed in a quiet, private room at a university hospital. The remainder of the homeless sample were interviewed in a similar office at their hostel. All assessments were performed in the morning, as participants would be less likely to be intoxicated. Any participants who confirmed that there were intoxicated were not assessed.

All interviews, including administration of the WCST, were carried out by the author, a doctoral level neuropsychologist. All participants were debriefed and given compensation for participation worth approximately US$38. Participants were also provided with pre-paid taxis to and from the interview if needed.

3 Results

3.1 Demographics

The majority of the homelessness-experiencing group 61/72 (85%) were men, which was not significantly different to the control group (19/25 men, 76%), $X^2(1) = 0.98$, $p = 0.323$. Similarly there was no significant difference between the groups for age, $t(33.81) = 1.258$, $p = 0.217$ (homeless mean = 35, range 18−57; control mean = 38, range 20−63). However, despite attempts to recruit control participants with relatively low educational levels, the homelessness-experiencing group had significantly fewer years of education, $t(36.75) = 4.750$, $p < 0.001$ (homeless mean = 10.3, SD = 2.2, range = 0−16; control mean = 13.0, SD = 2.6, range = 10−19). The distribution of years of education for the two groups is shown in **Figure 1**. For both groups the mode is 11. However, for the homelessness-experiencing group the distribution is negatively skewed, with two participants scoring very low (0 and 2 years of education). In contrast the distribution for the control group is positively skewed. Thus, although the two groups are matched on one measure of central tendency, the participants in the homelessness-experiencing group have significantly fewer years of education than those in the control group.

3.2 Cognitive test performance

In these analyses, to adjust for family-wise error rate, a Bonferroni correction was made for four hypotheses tested, giving an adjusted significance threshold of 0.013. The mean number of categories achieved in the WCST by the homelessness-experiencing group was 1.94 (SD = 1.50), which is lower than the control group mean of 2.72 (SD = 1.72). The data was normally distributed. A linear regression model was produced predicting the dependent variable of WCST performance with the independent variables of group and years of education. This model, summarized in **Table 1**, was a significant predictor of task performance. Within the model years of education was a significant predictor of task performance, but group membership was not. To test for an interaction effect, the product of those two variables was added to the model in a second stage. This increased the predictive power somewhat, but the increase was not significant.

Using standard measures in clinical cognitive assessment, the two groups could also be compared on cognitive performance using education-adjusted scores provided in the test manual (Kongs et al., 2000). These are used clinically to identify impairments by converting performance to percentiles. Data for the homelessness-experiencing and control groups are shown in **Table 2**. This method defined two-thirds of the homelessness-experiencing group as being impaired, at least mildly. However, that criterion also classified nearly half (44%) of the control sample as impaired. Nevertheless, participants in the homelessness-experiencing sample were significantly more likely to be considered impaired than participants in the control sample, $X^2(1,102) = 4.001$, $p = 0.045$, $V = 0.203$. The qualitative interpretation of association suggests a "small" effect (Kim, 2017). Nevertheless, this seems to be over-pathologizing, given the high level of impairment suggested among the controls. If the criteria for impairment is made more stringent, at the 5th percentile, 38% of the homelessness-experiencing group meet criterion, but only 20% of the control group, but that still qualitatively small association is not significant $X^2(1, 102) = 2.571$, $p = 0.109$, $V = 0.163$.

To summarize the results of this section, educational experience was substantially associated with performance on the WCST. When this is accounted for, there is little evidence for raised levels of impairment in the homelessness-experiencing group compared to never-homeless control group. Nevertheless, given the numerous factors that potentially could impair neurocognitive function of individuals experiencing homeless, these are explored in greater detail in the next sections.

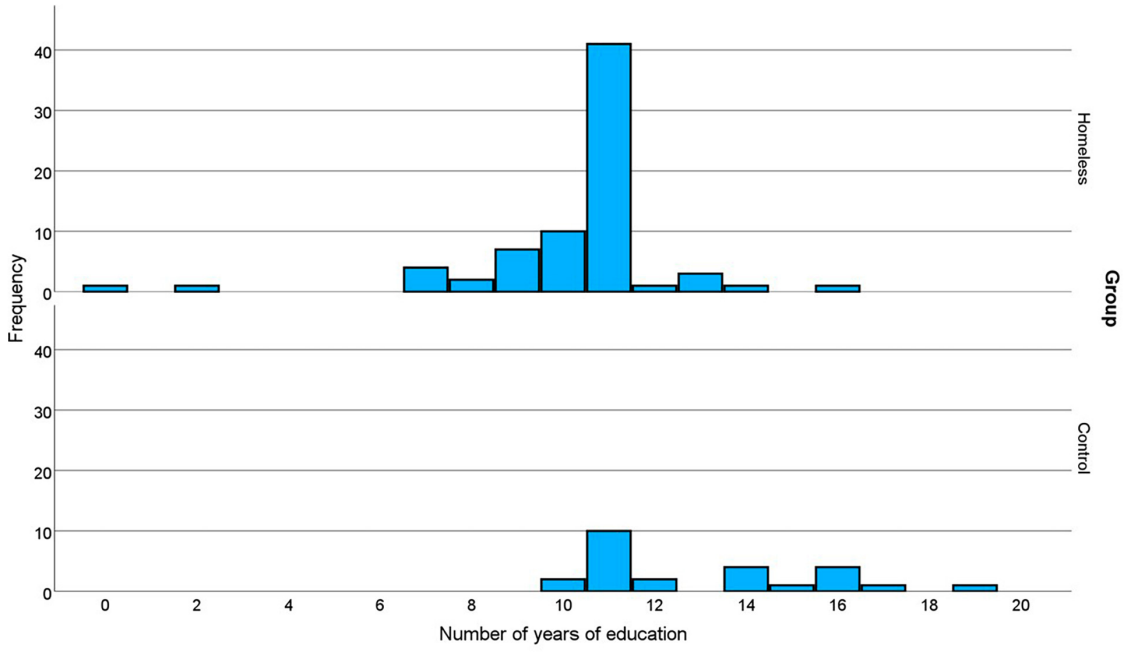

FIGURE 1
Distributions of years of education for the homelessness-experiencing and control groups.

TABLE 1 Regression models predicting Wisconsin Card Sorting Test performance from group membership (homeless / control) and years of education.

Predictor	*B*	*B* standard error	β	*t*	Sig.	Model fit	Sig. of change in R^2
(Intercept)	−0.23	0.70		−0.33	0.74		
Group	0.28	0.40	0.08	0.70	0.49		
Education	0.18	0.07	0.30	2.70	<0.01		
						$R^2 = 0.12$	<0.01
(Intercept)	3.87	2.33		1.66	0.10		
Group	−2.95	1.80	−0.82	−1.64	0.10		
Education	−0.17	0.20	−0.27	−0.82	0.41		
Interaction (Group*Education)	0.27	0.15	1.27	1.84	0.07		
						$R^2 = 0.15$	0.07

TABLE 2 Percentages of the homelessness-experiencing and control groups who scored at different percentiles for the Wisconsin Card Sorting Test (categories completed) when compared to normative data.

Percentile position	Homeless ($n = 72$)	Control ($n = 25$)	
>16th	33%	56%	Unimpaired
6–16th	29%	24%	Mild impairment
2–5th	21%	20%	Mild-moderate
=<1st	17%	0%	Moderate-severe

3.3 Neurological, psychiatric, and forensic history

Various dichotomous measures linked to brain health are shown in **Table 3**. The most frequently reported medical concern was lifetime history of head injury involving unconsciousness, reported by 68% of the homelessness-experiencing group. Many of the homelessness-experiencing participants (19%) also reported past psychiatric in-patient treatment, with 6% reporting that they were legally detained for the purpose of psychiatric treatment. Almost two-thirds of the sample reported ever having been imprisoned. Considering the stigma associated with such states, the figures are likely underestimates of the true figures.

To examine whether any of these clinical and forensic features are associated with WCST performance I examined point-biserial correlations (r_{pb}) between each binary feature and cognitive test scores. These are shown in **Table 3**. In these analyses, to adjust for family-wise error rate a Bonferroni correction was made, for eight hypotheses tested, giving an adjusted significance threshold of 0.007. There were no significant associations.

To summarize this section, although clinical disorders affecting the brain were highly prevalent in the homelessness-experiencing

TABLE 3 Percentages of the homelessness-experiencing sample ($n = 72$) reporting clinical and forensic features, and the correlation with Wisconsin Card Sorting Test Performance.

Feature	Frequency	95%CI of frequency	r_{pb}
Head injury	68	57–78	0.07
PTSD	32	22–43	−0.11
Seizure	18	10–28	−0.25
Epilepsy	3	0–7	n/a
Personality disorder	8	3–15	−0.09
Schizophrenia	5	1–14	−0.06
Tourette's syndrome	1	1–4	n/a
Korsakoff's	1	1–4	n/a
Obsessive-compulsive disorder	0	n/a	n/a
HIV	0	n/a	n/a
Psychiatric admission	19	11–29	−0.19
Legally detained for psychiatric treatment	6	1–11	−0.19
Been in prison	65	54–75	−0.07

r_{pb} values show point-biserial Pearson correlation coefficients, only calculated when frequency of feature >4. No significant associations were observed at the adjusted significance threshold of 0.007 (two-tailed).

sample, there are no statistically significant associations with WCST performance. In the final section of results, I examine how substance abuse and other addictive behaviors may be linked to executive impairment in adults experiencing homelessness.

3.4 Substance abuse and gambling

Levels of substance abuse in the past year were very high in the homelessness-experiencing group. Only 25/72 (35%) reported no daily use (defined as using most days over a period of at least 2 weeks). In fact, a large proportion of the sample, 28/72 (39%) had regularly used at least two different classes of substance in the past year. Looking at past month use, the most commonly abused substances were, in order, cannabis, crack cocaine, heroin, benzodiazepines, and ecstasy tablets. This is summarized in greater detail in the **Supplementary Table**, including correlations with WCST scores. About one-third of the homelessness-experiencing sample had been using drugs intravenously in the past month, 23/72 (32%). Of those, all showed risk-taking behaviour, e.g., reusing syringes. The mean syringe-use risk-taking score was 6.1 (SD = 4.6). There were no significant correlations between any substance abuse variables, including risky syringe use and WCST scores.

A large proportion of the homelessness-experiencing group reported no alcohol use in the past year, 28/72 (39%), however, in contrast, an even larger proportion, 31/72 (43%) were drinking at levels considered harmful or hazardous. Regarding probable gambling addiction, only 3/72 (4%) of the homelessness-experiencing participants were positive. In fact, 28/72 (39%) denied gambling at all in the past 12 months. There were no associations between any of the alcohol use or gambling addiction scores and WCST performance.

4 Discussion

The current results suggest that, on one widely-used measure of "frontal-lobe executive function," there was no apparent impairment in a sample of homelessness-experiencing adults when education level is accounted for (i.e., in the linear regression). This challenges numerous studies that have suggested that executive function and other frontal-lobe related impairments are commonly observed in homelessness-experiencing people (Douyon et al., 1998; Spence et al., 2004; Pluck et al., 2011, 2015; Davidson et al., 2014; Rogoz and Burke, 2016; Piche et al., 2018; Stone et al., 2019; Fry et al., 2020). Furthermore, despite several suggestions that such deficits predispose homelessness-experiencing people to disorganized behavior and risk taking (Piche et al., 2018), we found no associations between WCST performance and two measures of risk taking. Those measures were gambling (in the full sample of homelessness-experiencing individuals) and risky HIV behavior (in the subsample who were intravenous drug users).

The reason that so many studies have linked impairments to homelessness may be partly because of comparisons of homelessness-experiencing participants to inappropriate controls. When control groups are included, rarely is their educational background matched to that of the homelessness-experiencing participants. This is important because education level is a good indicator of early-life background. Indeed, years of education is frequently used in epidemiological research as a proxy measure of an individual's parental socioeconomic background, because it is largely influenced by caregivers and mainly fixed by adulthood (Galobardes et al., 2006). Several studies have reported either low socioeconomic status family backgrounds (Koegel et al., 1995; Benjaminsen, 2016), or low education levels in people experiencing homelessness (Fry et al., 2020; Pluck et al., 2020; Chevreau et al., 2023), which was also shown in the current study.

Because of the strong associations between cognitive test performance and socioeconomic status in general, the threshold for "impairment" is often misapplied when considering participants who come from lower education backgrounds. In contrast, two recent studies have reported cognitive function of adults experiencing homelessness, analyzed at the group level, that may be in the normal range (Chevreau et al., 2023; North et al., 2023), when compared to standardized scores. Both studies included classic tests of executive function or tests of fluid ability, which are very closely linked to the concept (Martin et al., 2015). Furthermore, both studies noted that formal education and literacy levels were substantially lower than would be expected, compared to the national population.

However, normative data is still not a good solution to the problem of detecting impaired performance in lower-education-level populations. This also often grossly overdiagnoses cognitive impairment in homelessness-experiencing and other relatively low socioeconomic status populations (Pluck, 2023). This is because most commonly, the average anchor point used to define "normal," is that of people with average level of education for the population. One example of this is the Delis-Kaplan Executive

Function System (D-KEFS; Delis et al., 2001). This is probably the most widely-used executive function battery, with a normative sample of 1,750 people. However, the normative scores are not adjusted for education level. This battery has, for example, been used to demonstrate "cognitive deficits" in people experiencing homelessness (Saperstein et al., 2014). That comparing relatively-low education level individuals to such normative scores is unfair can be shown by comparing the sample for education level. In the D-KEFS, for adults aged 30—40, only 1.3% of the normative sample had education of 8 or fewer years (that is 2 participants out of the 150 tested). In the current sample 11% had that level, a 9-fold difference.

Tellingly, Gicas et al. (2023) used a battery of executive function tests, and found impairments in their homelessness-experiencing sample only when normative tables that were not education-adjusted were used (for sustained attention and mental flexibility). When the Stroop test was analyzed, which did have education-adjusted norms, the homelessness-experiencing sample scored normally. Even if education-adjusted norms are used, they may still over pathologize homeless populations, because there is a floor effect in the tables. As an illustration, the Frontal Systems Behavior Scale (Grace and Malloy, 2001) adjusts for education level by having separate tables for participants with 12 or fewer, and more than 12 years of education. The low-education table would have been used to calculate adjusted scores for 93% of the homelessness-experiencing sample included in this study. Scores are therefore unlikely to be adequately adjusted for education level.

A maxim in neuropsychological testing, though often overlooked, is that there is "*no such thing as a neuropsychological test. Only the method of drawing inferences about the tests is neuropsychological*" (Walsh, 1992; p. 122). This important point was recently developed further by Turnbull (2023). The crux of the issue is that there are many reasons why people can perform poorly or well on a test, other than integrity of the presumed cognitive process (e.g., motivation, distractibility, past familiarity with the test materials, education level etc.). However, as Poldrack et al. (2011) have pointed out, there is a tendency within cognitive neurosciences, though quite erroneous, to equate tasks with cognitive constructs, such as referring to the "Stroop inhibition task" or "Wisconsin Card Sorting test of switching." Hence, relatively low performance on such tasks is implicitly associated with impairment in the presumed construct.

This is likely one reason why there has been so much over-detection of cognitive impairment in homelessness-experiencing samples. The WCST has been so widely used to detect supposed frontal lobe impairments that it is often referred to explicitly as the Wisconsin Card Sorting Test of frontal lobe integrity (e.g., Clark et al., 2005; Chamberlain et al., 2006) or other such names explicitly labelling it as a measure of frontal function. Thus, researchers can sometimes erroneously assume that low scores on the test indicate frontal lobe impairments, neglecting the overall context of performance, such as education level of the test taker.

This bias led David (1992) to highlight what he called "psychiatry's new pseudoscience," jokingly naming it "frontal lobology." One of the issues that David raised was the specificity of measures of "frontal lobe function" such as the WCST. Even in the neurologically healthy, relatively low performance on such tests is influenced by a range of factors. In fact, impaired performance on the WCST is just as likely after posterior brain lesions as it is after frontal lobe lesions (Jodzio and Biechowska, 2010), and to consider it a pure test of frontal function is highly inaccurate (Nyhus and Barcelo, 2009). Overall, it is not reasonable to assume that performance on that test can reveal much about integrity of the frontal lobes specifically, though, if interpreted carefully, it can be used to infer cerebral impairment. The same rule can be applied to several other cognitive tests that have been used to infer frontal lobe impairments in homelessness-experiencing samples, such as the Trail Making Test (Rogoz and Burke, 2016), which is also not specifically sensitive to frontal lobe dysfunction (Chan et al., 2015).

I have, as a researcher, shown this bias in my own studies on homelessness. The issue of frontal lobology is being raised here not to accuse any researchers of pseudoscience, but to bring awareness of the risks of over pathologizing. This can have serious consequences, especially when it involves an already very marginalized demographic, such as people who are experiencing homelessness.

Furthermore, the negative result found here, when education level is controlled for, certainly cannot rule out some level of cognitive impairment associated with homelessness. Given the multiplex physical and psychological health challenges faced by many people lacking homes, there often will be some impact on neurocognition. Nevertheless, the severity of this may have been exaggerated. In the current study I report high levels of substance abuse, neurological, and psychological illness. However, of multiple factors examined, none were significantly associated with WCST performance. Many previous studies have linked these factors to neurocognitive performance in non-homeless samples. It is perhaps, because of the multiple pathways to homelessness that these factors are not strongly associated. For example, although substance abuse may impair cognition in some people who are experiencing homelessness, it may also be that some people with relatively higher levels of cognitive ability become homeless due to their substance use. This would obscure simple linear relationships between substance abuse and cognitive ability. Similar issues could be involved with neurological and psychiatric illnesses.

One final observation, again, against the conclusion of a general frontal-lobe syndrome associated with homelessness, is the very low level of pathological gambling reported by the homelessness-experiencing sample. Despite high levels of other addictive behaviors, such as intravenous substance abuse, only 4% of the homelessness-experiencing sample reported pathological gambling. Such behavior is often associated with idiopathic and acquired neurological disorder affecting frontal-subcortical circuits (Santangelo et al., 2013; Turner et al., 2019), and many pathological gamblers show executive function deficits. The low prevalence reported here is therefore not consistent with a dysexecutive syndrome linked to homelessness.

In conclusion, little evidence is provided in the current research to support an executive function impairment associated with adult homelessness. It is suggested that "frontal lobe syndrome," linked to homelessness in many previous studies, is overestimated due to misleading comparisons of neuropsychological test scores to inappropriate control groups or normative data.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by the North Sheffield Research Ethics Committee. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

GP: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

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Homeless people: a review of personality disorders

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Personality disorders in homeless people pose a challenge to the medical community and society, requiring specialized approaches for these super-difficult patients. The prevalence of personality disorders is higher in homeless populations than in the general population. However, there is a knowledge gap regarding personality disorders among people experiencing homelessness, and the implications of this lack of recognition are substantial. This paper provides a brief narrative review of personality disorders among homeless individuals. The primary importance and specificity of these disorders in this population remain unexplored. We searched PubMed and Web of Science databases in February and November 2023 using the keywords 'homeless' and 'personality disorder', and selected fifty-eight studies to be included in this literature review. The main themes of the results were personality disorders in homeless individuals and comorbid psychiatric disorders; risk factors and other psychological and behavioral data; clinical and intervention outcomes; and challenges linked to assessment, treatment, and intervention. The homeless population experiences significant diagnostic variability and the diagnosis of personality disorders is still evolving, contributing to difficulties in diagnosis, assessment, and treatment. A future challenge is to raise clinical awareness and optimize research knowledge, assessment, and intervention in personality disorders among homeless individuals with comorbid psychiatric disorders.

KEYWORDS

homeless, personality, psychiatry, psychology, psychopathology, mental health

1 Introduction

Personality disorders (PD) among the homeless pose a challenge to medicine and society and are many times framed as difficult or super-difficult patients. Difficult, because they are prevalent in primary care settings, have more psychiatric disorders, functional impairment, health care utilization, and dissatisfaction with care (1). Super difficult,

because besides all that, they are homeless, living and dying on the streets, neglected by society, lacking the appropriate health care from community psychiatry (2).

PD's affect more than 10% of the population but are widely ignored by health professionals due to the associated stigmas (3). However, available data remain scattered; two recent meta-analyses reported varying prevalence estimates for lifetime PD of 25.4% (4) and, around 7.8% (5). Studies have shown that PD causes considerable morbidity, is associated with high service and societal costs, and usually has an adverse effect on the progress in the treatment of other psychiatric disorders (6). Challenges also include difficulty in approaching the patient because of poor pharmacological results and a significant treatment abandonment rate (7). According to some experts, PD should be recognized as a psychiatric priority and a major condition in mainstream psychiatry across the world (5, 6). The principal challenge of the 21st century is determining the most efficient treatment for PD (7).

The prevalence of PD's is much higher in homeless individuals than in the general population (7–9). A recent systematic review (10) highlighted that PD is very common in homeless individuals, with frequencies ranging from 64% to 79% for any PD. Some authors (9, 11, 12) have drawn attention specifically to the gap in knowledge about PD in individuals experiencing homelessness based on the absence of reliable and valid PD diagnoses. The implications of this lack of recognition of PD and the limited data about them in homeless populations are substantial (8, 9).

Research on PD in homeless people is limited. This article briefly reviews the existing literature on PD in homeless population and intends to address the existing data based on the state-of-the-art research topic.

2 Methods

Our research was conducted with the terms 'homeless' and 'personality disorder', in searches managed on PubMed (search details: (homeless*[Title/Abstract]) AND (personality disorder [Title/Abstract])), and on Web of Science (search details: (homeless*[Title]) AND (personality disorder [Title])) – both without any time limit. On February 20th and November 17th, 2023, the results yielded 65 articles on PubMed and 66 articles on Web of Science based on the above-mentioned keywords. A book was included following a manual search. The two authors served as evaluators. Of the 131 entries, considering the exclusion criteria of duplicates and articles unrelated to the topic. Only English and French documents (with abstracts in English) were considered. Finally, a total of 58 articles were subjected to analysis in this narrative review.

3 Results

3.1 Personality disorders in patients living homeless and comorbid psychiatric disorders

Fazel's (8) systematic review and meta-regression analysis, drawing on data from 5684 homeless individuals, reported the prevalence of PD among the homeless in Western countries as 23.1% (CI 15.5%–30.8%). Similar data were observed in a population of 500 homeless patients in Portugal (13) and in Germany (14) both at 24%. While in Stockholm, a prevalence of 12% was reported in 1704 homeless patients receiving hospital care (15). In Japan it was 3.5% (≈114 homeless) (16). Conversely, a prevalence of 50% was observed in data from London with 560 homeless men (17) and 57% based on the Edinburgh survey (≈44) (18). The prevalence reached a record high of 80% in a French study using epidemiological measures (≈1200 homeless men) (19) and 88% (with a mean of 3.5 diagnoses per participant) in the United States of America (USA) (≈99) (20). These examples illustrate the extensive range and diversity of conditions analyzed, emphasizing the clinical relevance of data on the presence of the PD's among homeless populations.

A substantial number of psychiatric disorders are well documented in homeless populations (13). Homeless people with multiple diagnoses have greater mental health needs and worse general health determinants (9, 13). A general synthesis of the prevalence of comorbid psychiatric disorders in homeless patients, according to reports reveals the following figures: psychotic disorders among 4.4%–57% (8, 13, 14, 16); major depression among 11.4% (8); bipolar disorders among 11.4%–17.5% (8, 16); alcohol dependence among 14.3%–37.9% (8, 13, 14, 16); drug dependence among 14.3%–34% (8, 13, 14, 16); acute stress reaction among 23%–24% (13, 14); and anxiety disorder among 2.3% (16). These references are based on studies carried out in the USA, France, Japan, Portugal, and Germany.

The findings from ten-year records of homeless patients attending emergency services (≈2750) in the USA show greatly increased rates of admissions for alcohol, substance abuse and psychiatric-related problems, particularly for schizophrenia (Odd Ratio, OR:16.6) and PD (OR:15.4) (21). Lipton's study (22) of homeless patients at a hospital emergency department supported this finding: 96.6% of this patient population had a previous psychiatric hospitalization, 72% had been diagnosed with schizophrenia, and the second most common diagnosis was PD (13.3%). In another study conducted in Portugal by Bento and Barreto (23) with a reference population of 511 homeless patients, 94% of the overall sample included patients with psychiatric disorders, excessive alcohol/drug consumption, and PD's.

A small number of studies have recognized the existence of specific PD among the homeless, including antisocial, schizoid, dependent, and borderline PD's (12). Connoly et al. (12) reported that the rates of specific Axis II disorders exceeded the rates of specific Axis I disorders by 50%. However, few studies have conducted systematic assessments of the full range of PD or evaluated their relationship with the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) Axis I diagnoses, often relying on unstructured assessments (11, 12). In this brief review, we identified only seven studies addressing the full range of PD diagnoses (7, 12, 19, 20, 24–26). For data systematization *vide* Table 1, where we also included the geographic area and its respective climate type (27). All studies were done in both sides of North Atlantic Ocean: four in the East coast of the United States of America and three in the Western part of the European Union. We believe the harder winters in humid continental climates at the states of Massachusetts, New York and

TABLE 1 General data of the specific personality disorders among the homeless people in the studies included in the present review.

Publication	*N*	*Mean* Age	Sex	Personality disorders(%)	Psychiatry disorders(%)	Area (Climate)
Bassuk et al. (25)	80	27	100% female	Axis II total(71) Schizoid(3) Antisocial(4) Borderline(6) Histrionic(1) Narcissistic(4) Dependent(24) Other(13) Atypical(10) Mixed(4) Passive-aggressive(4)	Axis I total(27) Affective disorders(10) Substance abuse(9) Mental retardation(5) Schizophrenia(3)	Massachusetts, United States of America (Humid Continental)
Ball et al. (24)	52	38	94% male	Paranoid(74) Schizoid(42) Schizotypal(56) Antisocial(47) Borderline(51) Histrionic(23) Narcissistic(35) Avoidant(63) Dependent(12) Obsessive-compulsive(61) Cluster A(88) Cluster B(74) Cluster C(85)	Illicit substance abuse(50) Alcohol abuse(50)	New York, United States of America (Humid Continental)
Connolly et al. (12)	60	41	68% male	Paranoid(73) Schizoid(65) Schizotypal(43) Antisocial(57) Borderline(62) Histrionic(20) Narcissistic(57) Avoidant(50) Dependent(25) Obsessive-compulsive(57) Cluster A(92) Cluster B(83) Cluster C(68)	Substance dependence(62) Anxiety disorders(62) Mood disorders(55) Psychotic disorders(20)	New York, United States of America (Humid Continental)
Combaluzier et al. (19)	212	27	100% male	Axis II total(95) Paranoid(1) Schizoid(9) Schizotypal(1) Antisocial(42) Borderline(16) Histrionic(4) Avoidant(4) Dependent(12) Obsessive-compulsive(2) Other(5)	Drug dependence(100)	France, European Union (Oceanic)
Samuel et al. (20)	99	41	57% male	Axis II total(86) Paranoid(55) Schizoid(39) Antisocial(≈20) Borderline(≈20) Histrionic(9) Narcissistic(41) Dependent(5) Obsessive-compulsive(58)	Axis I total(85) Mood disorders(67) Substance use(66) Anxiety disorders(59) Post-traumatic stress(25) Psychotic disorders(19)	Connecticut, United States of America (Humid Continental)
Salavera et al. (7)	89	39	100% male	Paranoid(14) Schizoid(19) Schizotypal(16) Antisocial(26) Borderline(9)	–	Spain, European Union (Hot Summer Mediterranean)

(Continued)

TABLE 1 Continued

Publication	*N*	*Mean* Age	Sex	Personality disorders(%)	Psychiatry disorders(%)	Area (Climate)
				Histrionic(79) Narcissistic(9) Avoidant(14) Dependent(20) Obsessive-compulsive(23) Aggressive(15) Passive(9) Self-defeating(9)		
Salavera et al. (26)	196	<40	–	Axis II total(79) Schizoid(21) Antisocial(26) Dependent(22) Obsessive-compulsive(26)	Attention deficit hyperactivity disorder	Spain, European Union (Hot Summer Mediterranean)

Connecticut may have an influence in how homeless people live, somehow different from what happens in Spain with Hot Summer Mediterranean and France Oceanic climate types (27). On the other hand, the cultural differences may not have such an impact, as all studies were performed in the prevalent and quite accepted homogeny of the Western world. Culturally speaking the White Anglo-Saxon Protestant (WASP) culture in the northeastern USA has little contrast with the Latin catholic culture in the western EU, in the impact how psychiatric homeless people live in the streets. Furthermore, in a systematic review (10) which is based on analysis of five of these studies (*i.e.*, 7,12,24,25,26), it is globally reported that the most prevalent PD diagnoses in homeless populations were paranoid (14%–74%), avoidant (14%–63%), borderline (6%–62%), and antisocial (4%–57%).

Other studies (28, 29) identified the most prevalent diagnoses among the homeless population as substance abuse and PD's, including antisocial PD (28). This population had higher rates of alcohol abuse disorder (men), drug abuse disorder (women), and antisocial PD (both men and women) (28). The only diagnosis that was more prevalent in homeless clinics than in communities was antisocial PD (28). Similarly, Caton (30) reported a significantly higher number of homeless individuals with a concurrent diagnosis of antisocial PD and borderline PD (9).

However, some authors have argued that among the homeless, many of the features of antisocial personality may be artifacts of homelessness and that strict application of the diagnostic criteria may be insensitive to nurture factors (11). A study among 600 homeless individuals (31), found that data support the appropriateness of the diagnosis of antisocial PD among these populations. Most adult symptoms of antisocial PD were associated with the number of childhood conduct disorder symptoms (nature), and the onset of symptoms usually preceded the onset of homelessness (31).

Other important findings suggest a higher-than-normal prevalence of schizoid PD potentially playing a role in treatment engagement and chronicity of homelessness (32) and schizotypal PD (33). Finally, the diagnosis of emotionally unstable PD appeared to be associated with homelessness referrals to an acute young adult psychiatric unit (34). Still, a single case report of a schizoaffective homeless man with a previous diagnosis of *haltlöse* PD highlights the need for more studies examining PD Not Otherwise Specified (NOS) (35).

3.2 Personality disorders related to risk factors among homeless people and associated psychological and behavioral outcomes

Personality disorders (OR: 2.2) are identified as a risk factor associated with an increased risk of homelessness. They along with severe psychiatric disorders, substance abuse, and pathological gambling constitute the most significant modifiable factor, as determined by a USA big data study examining risk and protective factors for homelessness (36).

Findings of a French research (19) (≈1200 homeless men) lead to the conclusion that PD increases the risk of substance abuse, subsequently increasing the risk of homelessness. This dual diagnosis has a high impact on homelessness. The comorbidity of drug abuse and PD multiplies the risk of homelessness by a factor of 7, accounting for 46% of the cases. Conversely, the association between PD and homelessness multiplies the risk of drug abuse by a factor of 13, accounting for 3/4 of drug abuse cases (19). Moreover, PD's appear to have a basic role in the etiopathology of such a morbid constellation because the frequency of their observation is independent of the association between homelessness and drug abuse (19). Another study (37) highlighted the association between homeless individuals and a specific group of people - those with serious substance misuse and PD (39.3%).

In a two-year longitudinal study conducted in Canada (38) young adults experiencing first-episode psychosis, within the homeless group were more likely to have childhood abuse, forensic history, non-affective psychosis, negative symptoms, substance use disorder, and the DSM-IV Cluster B PD (referred to as bad PD). It is also associated with poorer symptomatic and functional outcomes despite having more long-acting injectable antipsychotics, community treatment orders, and hospitalizations (38). Poor prognostic factors were related to Cluster B PD in intensive outreach services dedicated to homeless youth

experiencing first-episode psychosis and addiction in another longitudinal study (39).

Studies have reported that high rates of deliberate self-harm and suicide in the homeless are related to high rates of psychiatric disorders found in this population, predominantly schizophrenia (40). Among homeless individuals, those exhibiting high rates of drug and alcohol abuse and PD were most often those without a stable residence. They were more likely to be male, single, unemployed, recent victims of violence, prone to have violent behavior toward others (40), a criminal record, and to have a PD (40, 41), as well as increased mortality from all causes (40).

Data focusing on gender and prevalence of psychiatric disorders among hospitalized homeless patients (15) revealed the following. Homeless women were at a higher risk for psychiatric disorders than homeless men (1.20), and younger homeless women had the highest risk (2.17). Alcohol use disorders were equally common, but women had a higher prevalence of drug use disorders (1.32). Women were at higher risk of schizophrenia (2.79) and PD's (2.73). Indices of low quality of life include middle-aged homeless women living in temporary housing with criminal records, PD, and substance use disorders (42). Risk factor evaluation for homelessness among patients with severe psychiatric conditions (43, 44) show distinct patterns. Among homeless women with schizophrenia, higher rates of concurrent diagnosis of alcohol abuse, drug abuse, and antisocial PD, including less adequate family support (43); Among homeless men with schizophrenia, there was widespread concurrent substance abuse and antisocial PD (42%), and 72% had a history of incarceration (44). In addition to childhood antecedents, data indicate that drug abuse and antisocial PD preceded homelessness (44). Notably, 4/5 male patients experiencing homelessness had a triple diagnosis – concurrent schizophrenia, substance abuse, and antisocial disorder–indicating the presence of these traits even before adolescence (45). Consequently, inadequacies in psychiatric service discharge planning are most apparent among homeless men with heavy tri-morbidity (30).

Furthermore, antisocial PD is associated with illegal economic activities (selling drugs, theft, and prostitution) for income generation among the homeless (46). This association extends to youth homelessness (47), which in combination with arrest history serves as a risk factor for recurrent homelessness (48). Moreover, it is coupled with gambling disorder (49), violent behavior (50), and HIV risk in homeless individuals (51).

Engaging in survival sex is over-represented within homeless populations (52), and data show robust associations with symptoms of borderline PD, childhood abuse, and post-traumatic stress disorder among homeless women (52, 53), suggesting that older individuals with high levels of impulsivity symptoms may be especially at risk (52). Similar approaches among homeless men have shown that risky sexual behavior is accompanied by common symptoms of PD's and predicts treatment outcomes and suboptimal achievements in health-promoting or prosocial behaviors (54–56). Nevertheless, a risk index comprising key symptoms of antisocial/borderline disorders plays an essential role in sexual risky behaviors in both sexes (57).

Another focus comes from the sheltered homeless families, with suspicions of probable child abuse or neglect, where it is observed that 1/4 of the mothers had the presence of major clinical psychiatric syndromes and 70% of the mothers had PD (25). In this follow-up on the relationship between homelessness, mental health, and motherhood, the findings showed that 2/3 of the young mothers with children in their care met the criteria for lifetime antisocial PD (58) and borderline PD (59). These were further associated with criteria for lifetime major depressive episodes, post-traumatic stress disorder, and drug abuse (58).

3.3 Personality disorders in relation to clinical and intervention outcomes among homeless people

The risk factors for unplanned hospital admission in homeless individuals have been reported (60). Enduring psychiatric conditions and/or PD (OR:3.84), establish themselves as the greatest risk factors increasing the likelihood of admission by almost four-fold. This impact on the likelihood of poor physical health outcomes, potentially because of a lack of engagement or late presentation to services. When homeless patients access health services, maladaptive behaviors are often associated with poor attendance, reduced effectiveness of therapeutic alliances, failure to follow through on referrals, noncompliance with medications for medical or psychiatric symptoms, and suicidal behaviors (24).

A congregation is characterized by high rates of PD's among profiles of homeless individuals, and high overall medical service use (29, 42). In contrast, homeless patients who underuse mental health services (24, 30, 61) are more likely to receive psychiatric treatment in hospitals rather than in outpatient services and have inadequately planned psychiatric hospital discharge. This is more likely if they have comorbidities of schizophrenia, substance abuse, and antisocial PD (30).

PD's significantly influence the failure of homeless people to adhere to treatment (12). When homelessness and PD coexist, the likelihood of treatment non-adherence increases. Notably, Cluster B PD are associated with avoiding permanence in the treatment process, while Cluster C PD (referred to as sad PD) are connected to favored treatment adherence and improved prognosis (7). Specifically, borderline and passive-aggressive PD's (another type of PD NOS) were reasons for treatment abandonment in 100% of the patients. Additionally, patients with antisocial, obsessive-compulsive, or paranoid PD seemed to be related to treatment abandonment (7).

Concerning factors associated with health service use, the literature reports that, in young homeless people, the presence of PD (OR:4.9) was estimated to be one of the factors that improved lifetime health service utilization or follow-up (62).

In addition, the presence of PD in the homeless is linked to several factors: poorer rates of adherence and completion of psychiatric and therapeutic treatment (63), worse outcomes for treatment of depression, and an increased risk of deliberate self-harm (8), insecure types of attachment that may impact

intervention strategies (10), acting as a barrier to the formation of a therapeutic alliance (64), influencing the benefits of therapeutic approaches (19), and contributing to comorbidity in dual diagnosis that may benefit from pharmacist intervention to address medication-related problems (65).

3.4 Challenges linked to personality disorders in the assessment, treatment, and intervention for homeless people

Traditional models of service delivery in Western countries, which focus on those with severe psychiatric disorders, may not meet the mental health needs of most homeless individuals with substance dependence and PD (8).

Authors such as Bassuk et al. (25) drew attention to PD as a diagnosis of social dysfunction and did not consider the influence of environmental factors extrinsic to the organization of personality, such as poverty, racism, and gender bias. The criteria for these disorders are descriptions of behavioral disturbances that are long-term and predate homelessness. Thus, the labels should primarily be used to indicate severe functional impairment and the need for help rather than implying strict causality (25).

According to Ball et al. (24), some of the paranoid, hostile, and bizarre symptoms of the homeless may be adaptive or at least understandable, given the extreme challenges of living on the streets or in a shelter. Although a diagnosis of PD requires evidence of the early onset of maladaptive traits, it is difficult to rule out the possibility that some Cluster A PD (referred to as mad PD) may be better understood as a consequence rather than as a cause of homelessness (24).

Furthermore, there are very few studies on homeless populations that have systematically assessed the full range of PD's using appropriate and rigorous methodologies and evaluation criteria for PD assessment, thus concluding that this is an important gap and challenge (11, 12).

Mental health services for the homeless facing particularly high levels of factors associated with suicide and homicide, a significantly higher prevalence of PD, and targeting poor compliance and complexity of disorders, require significant input from multidisciplinary mental health team members (66). Managing mood in this population remains a major challenge and nonpharmacological treatments (including complementary agents and psychosocial interventions) should be evaluated to address this issue (50). Additionally, data indicate that PD's in the homeless are probably more common among women emphasize an important factor for social and healthcare services to bear in mind (15).

Although it remains unclear whether this group of patients is amenable to individual or group psychotherapy, they have a profound need for other social services, and some may benefit from counselling or pharmacotherapy to help improve adaptive functioning or reduce Axis I symptoms (24).

Clinicians treating homeless outpatients may benefit from having special facilities for the diagnosis and management of PD's and substance abuse along with expertise in other comorbid psychiatric disorders (28). Homeless treatment seekers might benefit from the specialized programming and services of clinicians who are especially proficient in recognizing and treating the disorders best represented in these populations, which are notoriously difficult to manage (28).

Highlighting that, early trauma experiences have lifelong consequences, so complex trauma, appears to be intrinsic related to psychopathology and personality disorders in the homeless persons (8, 10, 29). Within the developing of Trauma-Informed Care (TIC), an awareness of these issues in a range of services, should improve the establishment of Psychologically Informed Environments (PIE) first taking place in re-designed facilities for homeless people (29, 67).

Nevertheless, we cannot be sure if paranoid, avoidant, or even obsessive-compulsive personality disorders are cause or consequence of being homeless. All these three personality disorders may be mimicked by survival street behavior. For example, a person experiencing homelessness can perfectly assume an avoidant and/or paranoid to avoid conflicts with other people. On the other hand, obsessive compulsive personality disorder can be mimicked by a hoarding behavior, especially with food or other essential items, in order to increase the chances of survival (10). Regarding the anti-social PD is even more difficult to distinguish cause/nature from consequence/nurture: was the homeless born genetically vulnerable to psychopathy or it was the street hard life than made that person a sociopath?

Further investigations are needed regarding homeless people with psychiatric disorders and their treatment, particularly those with multiple diagnoses that have worse health determinants (13).

As a main conclusion and guideline for further research, Salavera et al. (7) viewed PD as a prognostic factor in treatment. Therefore, reintegration processes, and prevention strategies must be clearly established, considering the subject's personality as a basic element, and providing an individualized therapeutic process (7, 29). Knowledge of these personality traits should be used to advocate for better healthcare services for supporting homeless individuals (7).

4 Conclusion

The homeless population suffers from major diagnostic variability and the diagnosis of PD's is still evolving, contributing to difficulties in diagnosis, assessment, and treatment. However, further studies are warranted and should focus more on the causes and effects of events. It is important to highlight as a limitation that the percentages of personality disorders analyzed in this review are based on studies with a disparate number of participants.

Does PD predispose individuals to homelessness? Does precocious homelessness contribute to PD? Does antisocial psychopathy increase the probabilities of homelessness? Or is it the homeless lifestyle that produces antisocial sociopaths? Do obsessive-compulsive personality hoarding habits lead to people being expelled from home and condemned to street life? Or is it homelessness that produces hoarding behavior for better chances of surviving on the streets? How many PD's are NOS, such as *haltlöse* or passive-aggressive, and are underestimated among homeless people? What is the importance

of attachment dysfunctions? What is the role of PD's secondary to organic conditions such as seizures or epilepsy, which is also common among homeless people (68)?

A challenge for the future is to raise clinical awareness and optimize research knowledge, assessment, and interventions for PD's among homeless individuals with comorbid psychiatric disorders and drug abuse. These individuals are often referred to as super-difficult patients, the subjects of Marontology, a new, unborn, medical specialty, suggested after the Greek word *maron-tos*, which means unwanted (69).

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Homelessness and housing problems in admitted psychiatric patients in Flanders, Belgium

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Homelessness in psychiatric patients in Flanders, Belgium, has never been investigated. Advocacy groups from patients with lived experience of psychiatric disorders have sounded the alarm on the scarcity of suitable housing options, the strain on psychiatric institutions, and the challenges faced by social service workers. To investigate the extent of the problem a survey on the topic was initiated. A "homelessness-in-mental-health-questionnaire" was designed by experts in the field. The social services of all Flemish psychiatric hospitals and all psychiatric wards in general hospitals were contacted and invited to complete this survey. 24 of 70 contacted services responded. The total number of homeless patients in the inpatient setting on an annual basis are estimated to an average 19.5%. 18% of homeless patients remain longer in admission due to the lack of housing options. 13.7% of homeless psychiatric patients are referred to a community care facility such as an assisted living facility. Social service respondents reported spending an average of 27.4% of their work time on housing issues. The main focus points according to the respondents are the lack of priority measures for homeless psychiatric patients, psychiatric problems as a barrier to housing options and the shortage of adapted housing capacity. The conclusion of this study is the need for comprehensive policy interventions to ensure an adequate supply of suitable social housing for psychiatric patients, accessible mental health care, alternative housing options and crisis accommodation facilities. We propose a 10-point action plan on housing for psychiatric patients for policymakers and politicians.

KEYWORDS

homelessness, psychiatric patients, psychiatric hospitals, psychiatric wards in general hospitals, Flanders, Belgium, social service, action plan

1 Introduction

Extra-clinical factors such as the unavailability of suitable housing options are important determinants of prolonged hospitalization in acute inpatient settings (1). Many patients who exhibit a revolving door pattern of multiple hospitalizations are people living homeless (2). Homelessness and problems of residence remain a challenge for many patients with severe mental illness, and community mental health services are still far away from providing adequate treatment to this population (2).

Houselessness and homelessness cause far-reaching negative effects on physical and mental health. Research has shown increased incidence of malnutrition, chronic pain, skin diseases, musculoskeletal disorders, poor dental health, respiratory disorders such as community-acquired pneumonia, asthma and chronic obstructive pulmonary disease and infectious diseases such as tuberculosis, hepatitis C virus, Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) in psychiatric patients facing homelessness (3). A systematic review on the prevalence of mental disorders and major psychiatric diagnoses in homeless populations in high-income countries estimated any current mental disorder at 76.2%, with alcohol use disorders at 36.7%, drug use disorders at 21.7%, schizophrenia spectrum disorders at 12.4% and major depression at 12.6% (4). Accordingly, mortality rates are estimated to be fourfold (4). A systematic review and meta-analysis from 2024 showed comparable but slightly lower results (5). Men showed a significantly higher lifetime prevalence of mental health disorders (86%) compared to women (69%). The prevalence of specific disorders was 44% for any substance use disorder, 26% for antisocial personality disorder, 19% for major depression, 7% for schizophrenia, and 8% for bipolar disorder (5). This starkly contrasts with figures on psychiatric disorders in the general population. According to the most recent Global Burden of Disease study in 2019 (6), in high-income countries, the age standardized prevalence of schizophrenia and depressive disorders are estimated at 0.3% and 3.7%, respectively.

Research also shows that, whenever homeless people get into the hospital, the costs of treatment are higher compared to those of non-homeless patients (7). The elevated costs are partly explained by the length of stay, which is generally prolonged due to the mental health problems these patients have (7). Yet, an important share of the higher costs could not be explained by a prolonged length of stay alone (8). Disease severity at admission reflecting the limited availability of community mental health services is most probably the main reason of higher financial costs (8).

All major independent international organizations agree that policy decisions on healthy living should be a short-term priority. The World Health Organization states that improved housing conditions can save lives, prevent disease, increase quality of life, reduce poverty, help mitigate climate change and contribute to the achievement of the Sustainable Development Goals, including those addressing health and sustainable cities (9) The World Economic Forum advises non-profit organizations to accept the critical role in bridging the gap between governments and the private sector to improve the affordability of housing, as well as working with individuals to help them understand their options and make informed decisions (10).

Policy recommendations on the health of homeless people in high income countries (11) not only mentioned the need for establishment of homeless teams in all metropolitan centers, but also emphasizes the importance of clarifying the costs of such services. Recent research on homelessness patients in an inpatient psychiatric care settings in Berlin showed an 15.1% increase rate on a 13-year period (2008–2021) (12). On the socio-demographical level of this study findings, remarkable conclusions were the lack of expanding social housing capacity despite a substantial growing population, and a comparable disequilibrium between the rising number of inhabitants and a much slower increasing inpatient mental health care (12).

Although homeless patients with severe psychiatric disorders pose a significant challenge for healthcare and social support services, positive outcomes have been reported with various forms of treatment. A systematic review on psychosocial interventions for homeless individuals with mental illness demonstrates the positive effects of critical time intervention, case management, housing support intervention, assertive community treatment, and life skills training on sustaining housing stability, preventing relapse, reducing hospitalizations, and improving quality of life of the homeless persons with mental illness (13). A systematic review and meta-analysis on housing first (homeless assistance approach that prioritizes providing permanent housing to people experiencing homelessness without prerequisites), shows not only a reduction on homelessness and non-routine health service use, but also a limitation in problematic substance use (14).

Advocacy groups from patients with lived experience of psychiatric problems in Belgium have sounded the alarm on the severity of housing problems in the psychiatric population in Belgium, the number of homeless patients in psychiatric wards and its impact on mental health treatment in the task force group "Poor makes sick, sick makes poor" from the Estates General of Mental Health (EGMH) (15). The task force group consists of a delegation of mental health professionals, including a psychiatrist, psychologist, pharmacist, policy maker and patients with lived experience of psychiatric problems. The EGMH is an organization of all interested stakeholders within the extended mental health sector (16). The EGMH aspires to arrive at a shared vision of the current strengths and vulnerabilities within the mental health sector and translate them into policy recommendations and priorities for change (16).

Persons with lived experience of psychiatric illness in the "Poor makes sick, sick makes poor" task force group indicated that there are significant problems in terms of housing and sustainable residence for individuals with mental health problems (15). There is a fundamental shortage of affordable housing, leading to significant challenges for many psychiatric patients. Some of them become homeless, and there are no alternative housing options available. They end up in dire conditions in psychiatric institutions, where there is also no solution for their housing problems. Hypothesis are made that the large number of patients with residential problems admitted to psychiatric institutions are partly the cause of long waiting times for admission for other patients. In addition to the delay factor for admission of other acutely ill patients, homeless patients are thought to require so much time investment from therapeutic staff, especially social services, that regular care is compromised. Yet, there are no studies assessing the actual time investment of therapeutic staff.

A study in Belgium in 2022 demonstrated that thousands of deaths could be prevented if all neighborhoods had the same low mortality rates as the least deprived areas regarding housing conditions (17). Identifying and addressing hotspots of housing inequality with specific public interventions is crucial (17). On the other hand, there is no information available about the number of homeless individuals in Belgium, nor about the number among them who have psychiatric issues. The interdisciplinary knowledge center LUCAS at the Catholic

TABLE 1 15-item questionnaire on the problem of homelessness from the social service point of view.

1. What percentage of patients admitted on an annual basis are confronted with homelessness?	0–100%**	
2. What percentage of all present patients stay longer in the hospital solely due to housing issues?	0–100%**	
3. What percentage of homeless psychiatric patients are referred to another residential facility upon discharge, while they might be capable of independent living if adequately supported housing were available?	0–100%**	Assisted living facility for the older adults or a psychiatric nursing home
4. What proportion of homeless patients utilize prioritized allocation in social housing?	0–100%**	
5. What percentage of patients utilizing prioritized allocation in social housing are obliged to accept certain forms of care/support/follow-up?	0–100%**	
6. Does your hospital have a protocol/procedure/established method regarding the issue of homeless patients?	0 or 100**	n/y
7. Does your hospital implement an active policy regarding the prevention of evictions?	0 or 100**	n/y
8. What percentage of potentially homeless patients is this active policy applied to?	0–100%**	
9. What priority collaborations does your hospital have with other partners regarding finding housing for homeless patients?		OCMW*, emergency housing, social housing companies, social rental agencies, real estate agencies, abbeys or monasteries, hotels, homeless shelters run by CAW*, municipal or city-owned houses, hotels.
10. What percentage of the workload of the social service is spent on assisting patients with their housing issues?	0–100%**	
11. How would you rate the average housing provided to a patient with mental health issues by a social housing organization?		On a scale of 0 (completely unsuitable) to 10 (fully suitable)
12. How much insight does a housing landlord have into the specific vulnerabilities or needs of individuals with mental health vulnerabilities?		On a scale of 0 (completely unsuitable) to 10 (fully suitable)
13. How much insight do housing policymakers have into the specific vulnerabilities or needs of individuals with mental health vulnerabilities?		On a scale of 0 (completely unsuitable) to 10 (fully suitable)
14. According to you, what are the necessary steps to improve policies regarding housing issues for psychiatric patients?		Open-ended question
15. According to you, what are features that makes a living space suitable for psychiatric patients?		Open-ended question

*OCMW, openbaar centrum voor maatschappelijk welzijn (public center for social welfare); CAW, Centrum voor Algemeen Welzijn (Center for General Welfare).
**Results are found in Table 2.

University of Leuven is currently assessing local counts of individuals experiencing homelessness. The results of these counts from 3 major cities (Antwerp, Ghent and Leuven) are now available, but with substantial missing values (18). During the observation period of this study, 46% of homeless persons temporarily admitted to an institution in Antwerp, were staying in a psychiatric hospital or a psychiatric ward in a general hospital (19).

The task force group "Poor makes sick, sick makes poor" decided to initiate a survey on the extent of the housing crisis in psychiatric patients in Flanders, by exploring the proportion of homeless patients in psychiatric hospitals and psychiatric wards in general hospitals. Besides, its impact on the workload of social workers in psychiatric institutions was to be evaluated. The purpose of the research was to gather sufficient data and substantive material that can be used in negotiations with policymakers and the government, in order to strengthen and improve the position of psychiatric patients.

2 Methods

In April 2023, 4 members of the task force group "Poor makes sick, sick makes poor" (psychiatrist, psychologist, policymaker, and person with living experience of psychiatric disorder) developed a 15-item questionnaire on the issue of homelessness within the walls of a psychiatric hospital or a psychiatric ward in a general hospital, from the perspective of the social worker (Table 1). The position of the social worker was chosen as the focus because from the professional point of view, as they are most directly confronted with the issue of homelessness. The questionnaire consists of 15 questions, all directly addressing the issue of homelessness in psychiatric hospitals or psychiatric wards within general hospitals. Some of the questions involve estimates of the proportion of homeless patients overall, and the extended stay in the facility due to homelessness. This part is considered as the quantitative part of the enquiry. The other part of the questionnaire is more qualitative

TABLE 2 Results of the quantitative part of the questionnaire.

	Average	Median	Range
Percentage homeless patients per year	19,5%	13,8%	3–70%
Percentage homeless patients with prolonged stay in hospital per year	18%	5%	0–90%
Unnecessary referral to residential care facility	13,7%	2%	0–80%
Accelerated referral to social housing	6,5%	0%	0–60%
Compulsory support in social housing	78,2%	100%	0–100%
Protocol homelessness	52,2%	100%	0–100%
Protocol prevention eviction	95,8%	100%	0–100%
Implementation protocol prevention eviction	85,9%	100%	0–100%
Percentage working time on housing problems	27,4%	20%	5–65%

in nature, such as description of priority collaborations with social housing agencies.

In May and June 2023, we contacted the social services of all Flemish psychiatric hospitals as well as all psychiatric wards in general hospitals, by telephone to request their participation in this study. The names and telephone numbers of the psychiatric hospitals and the general hospitals with psychiatric wards were found on the website of the Flemish government (20). After carefully explaining the intent of the survey on behalf of the task force group "poor makes sick, sick makes poor" of the EGMH, we asked for oral informed consent, emphasizing that the participation was totally voluntarily and anonymous. After explicit oral informed consent, the "homelessness-in-mental-health-questionnaire" was then sent by mail to the social service worker, with the request to return it completed after 6 weeks at the latest. We estimated the task time to a maximum of 30 min. The descriptive statistical analysis was limited to calculating averages (arithmetic means) and medians of the percentages in the questionnaires (questions 1–5, 8, and 10).

3 Results

The questionnaire was answered a total of 24 times by employees of the social service of the respective psychiatric facilities: 11 responses out of the 40 psychiatric wards in general hospitals and 13 out of 30 psychiatric hospitals.

3.1 Quantitative results

In the quantitative part of the questionnaire, the total number of homeless patients in the inpatient setting on an annual basis was estimated to an average 19.5% of the total inpatient population, with a median of 13.8%, and a maximum of 70%. On the percentage of homeless patients who remain in admission longer than strictly necessary purely because of the lack of housing, estimates were made between 0 and 90%, with a mean of 18% of and a median of 5%. On average 13.7% homeless psychiatric patients (median 2%) in an inpatient setting are referred to a residential care facility such as an assisted living facility for the older adults or a psychiatric nursing home, despite the fact that they are able to live independently if sufficient suitable housing would be available.

In some cities, a very limited number of homes from the social housing corporation are reserved for psychiatric patients without requiring them to go through the regular waiting list. These accelerated referrals from psychiatric facilities to social housing companies are dismally low, averaging about 6.5% for homeless psychiatric patients. Almost all homeless patients (average 78.2%, median 100%) who are assigned housing through an accelerated referral system to social housing are required to accept residential counseling from before moving in until several years after. Exactly half of participating facilities reported having a protocol on how to deal with homeless psychiatric patients. Only one facility had no active policy to prevent eviction of hospitalized psychiatric patients. All others did have one, and this includes organizing household help or initiating a guardianship. More than 80% of the participating psychiatric facilities take active steps when a patient in a precarious living situation is threatened with eviction. They try to stop it by contacting the landlord or seeking legal help.

Social service respondents reported spending an average of 27.4% (median of 20%) of their work time on housing issues and homelessness. The results of this part of the quantitative questions are found in Table 2.

Other quantitative results were the following: the respondents give an average rating of 6.8 out of 10 for the appropriateness of homes provided by social housing associations to homeless patients with mental health problems. For respondents, a landlord of an independent property on the open market has poor insight into the housing needs of a person with mental vulnerability, with a rating of only 2.9 out of 10. Individuals involved in policymaking, politics, or housing associations score slightly better, but still fall significantly short with an average rating of 3.8 out of 10.

3.2 Qualitative results

In the qualitative part of the questionnaire, all respondents indicate that there are collaborative efforts with social housing corporations, social service organizations, temporary homeless shelters, and with cities and municipalities. Two institutions also have contacts with hotels and monasteries. At the same time, all participants emphasize that there are hardly any priority measures for homeless psychiatric patients. On the contrary, psychiatric vulnerability seems to act as a barrier to potential referrals rather than opening doors. Social support organizations even look insistently towards psychiatric facilities to extend the duration of hospitalization as long as a housing solution is not available.

The most significant concern highlighted by all respondents is a shortage of adapted housing capacity. First and foremost, they are

convinced that there should be a well-established network of crisis residences where homeless psychiatric patients can immediately find shelter, without it necessarily being a hospital bed and without their life on the streets escalating into a severe psychiatric crisis. For the respondents, there is a need for increased investment in infrastructure and manpower to address housing issues effectively. It is important to consider the preferences of the patients themselves, who often find communal living arrangements not feasible and prefer to have a place of their own. According to 13 respondents, a peaceful neighborhood is the most essential for a suitable residence for patients with mental vulnerability. 7 respondents mention the importance of sufficient nearby physical and mental healthcare, 4 of them a safe environment without nuisance and aggression. 8 respondents think a proper infrastructure for heating and electricity, sufficient comfort, and the opportunity for a cozy interior arrangement are essential features.

Additionally, there is a conviction regarding a structural problem in social housing. There is a shortage of housing units, and those available are often outdated. For individuals with mental vulnerabilities, it would be beneficial to have more support in processing and monitoring applications for social housing, especially for homeless individuals or those with psychiatric issues. This responsibility could be assigned to the social services of the city or municipality or to housing associations.

Another point of concern mentioned in the survey is the absence of suitable housing options for psychiatric patients who are not able to live entirely independently but also do not require a protected environment such as a psychiatric care facility or a residential care center for the older adults. Currently, the options seem to be either intensive support in a hospital, a protected environment, or living independently, with no middle ground. The seemingly endless waiting lists for suitable housing options lead people with mental health issues to lose hope, trapping them in a vicious cycle of illness. Searching for housing in the regular job market is highly susceptible to stigma and discrimination. This, too, contributes to a worsening of mental health problems.

4 Discussion

Almost 1 in 5 patients with a psychiatric illness in a psychiatric hospital or psychiatric ward in a general hospital in Flanders, Belgium, is homeless. 18% of all admitted patients stay longer in the hospital solely due to housing problems. This fact determines a significant part of the workload of social services associated with these admission settings. 27.4% of their working time is spent on solving these housing problems.

Searching for housing for a homeless patient during a psychiatric hospitalization is a challenging and difficult issue (21). A study in Canada revealed the need for adapted independent living options for psychiatric patients, but also more nursing homes and the increased specialization of existing residential resources (21). Homeless patients need shelter, and it is the duty of every facility to at least try to help find it when the patient is in admission. On the other hand, we must dare to question how much capacity of psychiatric beds in hospitals may be occupied by patients who are ready for discharge but do not have housing. This situation, indeed, contributes to longer waiting lists and hinders the patient flow from admission to discharge (21). Another study revealed that all homeless patients with prolonged stay in an acute hospital were relocated to a long-term care institution because the complexity of these patients' needs increased the difficulty in finding appropriate resources in a timely manner (22). It is also known that the lack of social support at discharge and the absence of availability of housing solutions are predictors of psychiatric readmission (23).

This study demonstrates for the first time the intensive time investment of social therapeutic staff in housing issues of admitted psychiatric patients. More than a quarter of all available time for social workers in psychiatric institutions is spent addressing housing problems for patients, exceeding the budgeted workload. It is also frustrating work due to the limited prospect of resolving these issues satisfactorily due to the severe shortage of suitable housing options. In Flanders, there is no additional hospital staff is funded by the government to support the problem of homelessness among patients in hospitalization. Addressing the housing issues of psychiatric patients requires a coordinated effort from various parties, including the government, local authorities, housing associations, healthcare institutions, and other societal organizations.

The limitations of this study were the questionnaire, which included estimates of the number of homeless patients, the quality of housing, and insight into psychiatric problems, but lacked objective, reproducible measurements. Additionally, there was a high likelihood of participation bias from respondents who are frequently confronted with homelessness in their work, compared to non-respondents.

The absence of sufficient adapted housing options for patients with psychiatric issues, the complete lack of social housing for vulnerable groups, the shortage of suitable housing in general, and a lack of interest from politicians and policymakers in this crucial problem leads to increased general and mental health problems for this target group. This is an individual medical-ethical but also societal problem, due to increased total costs. An editorial in Lancet states that policy makers must make access to adequate housing a key social determinant of health and see housing as a core public health intervention (24). It also endorses that health-care professionals have a pivotal role to play (24). It is therefore essential to formulate an appropriate approach to change. We suggest 10 point-action plan for policy makers:

1. Ensure an adequate supply of social housing as the primary form of prevention. The most vulnerable group of psychiatric patients always runs the risk of homelessness without subsidized housing.
2. Provide sufficient accessible mental health care for everyone, to prevent individuals with severe mental health issues from becoming homeless due to their illness.
3. Offer sufficient alternative housing options for psychiatric patients who can no longer live independently but do not require hospitalization or other care facilities. Consider options such as sheltered housing or group living.
4. Establish crisis accommodation facilities where homeless psychiatric patients can temporarily stay while awaiting a permanent housing solution.
5. Introduce housing coaches in mental health care institutions, both residential and outpatient, with the sole responsibility of assisting patients in finding housing and mediating housing issues. This would relieve the regular social services from dealing with housing matters.
6. Integrate mental health into all housing-related policy initiatives, emphasizing the importance of sufficient green spaces around the homes of vulnerable patients, accessible recreational activities, and good connectivity with public transportation.

7. Mandate safe and sustainable energy provisions in housing for psychiatric patients, similar to connections for phone, television, and internet, and integrate them appropriately into the overall rental costs.
8. Appoint a national and regional coordinator responsible for housing policy for psychiatric patients, who is accountable to the government, similar to a flu commissioner or a representative for drug policy.
9. Address disturbances therapeutically through outreach teams or other forms of guidance. Never deprive individuals of their right to dignified housing.
10. Invest in structural monitoring of the combination of homelessness and mental health problems and set concrete goals to reduce homelessness.

Adequate housing was recognized as part of the right to an adequate standard of living in article 25 of the 1948 Universal Declaration of Human Rights of the United Nations (25). There is no doubt that this article is being violated many times, every day, also in wealthy developed countries, and especially for the most vulnerable people. It is the moral duty of mental health professionals to strongly protest against this and do everything in their power to combat this injustice.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

KC: Conceptualization, Writing – original draft. KB: Conceptualization, Data curation, Methodology, Writing – review & editing. MatH: Data curation, Investigation, Writing – review & editing. LS: Writing – review & editing. YW: Conceptualization, Writing – review & editing. GI: Conceptualization, Writing – review & editing. MarH: Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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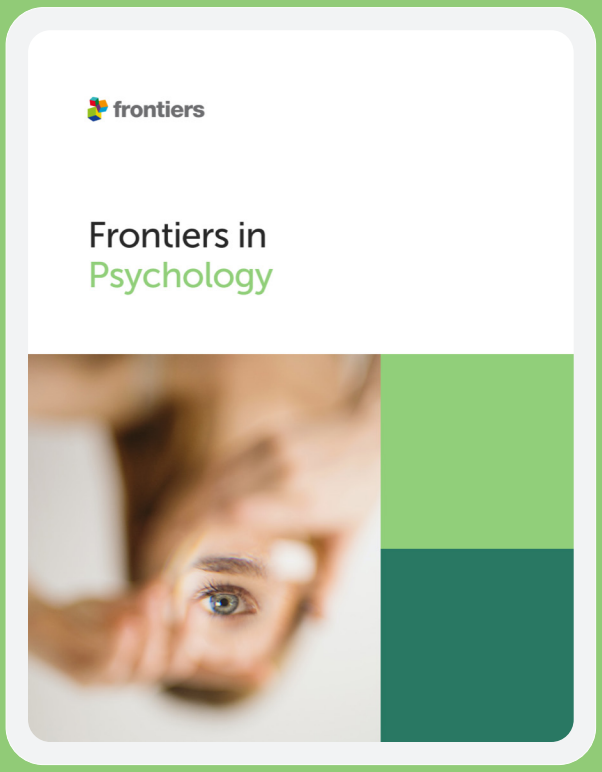

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