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Characteristics of adherence to methadone maintenance treatment over a 15-year period among homeless adults experiencing mental illness

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ABSTRACT

Background: Methadone maintenance treatment (MMT) has important protective effects related to reduced illicit opioid use, infectious disease transmission, and overdose mortality. Adherence to MMT has not been examined among homeless people. We measured MMT adherence and reported relevant characteristics among homeless adults experiencing mental illness in Vancouver, British Columbia, Canada.

Material and methods: Homeless adults living with mental illness who had received MMT prior to the baseline interview of the Vancouver At Home study (n = 78) were included in analyses. The medication possession ratio (MPR) was used to estimate MMT adherence from retrospective administrative pharmacy and public health insurance data collected across 15 years. Independent sample t tests and one-way ANOVA were used to test for significant differences in MMT MPR by participant characteristics.

Results: Mean MMT MPR was 0.47. A large proportion of participants reported blood-borne infectious disease, three or more chronic physical health conditions, and substance use. Being single and never married was associated with significantly lower MMT MPR (0.40 vs. 0.55, p = 0.036), while living with schizophrenia, bipolar disorder, or a mood disorder with psychotic features was associated with significantly higher MMT MPR (0.54 vs. 0.37, p = 0.022). Daily drug use (excluding alcohol) was associated with significantly lower MMT MPR (0.39 vs. 0.54, p = 0.051).

Conclusions: The level of adherence to MMT was very low among homeless adults experiencing mental illness. Efforts are needed to improve adherence to MMT as a means of reducing illicit substance use, preventing overdose deaths, and attenuating infectious disease transmission.

1. Introduction

Methadone maintenance is an established treatment for the management of opioid dependence, and is significantly associated with reductions in illicit opioid use (Gowing, Farrell, Bornemann, Sullivan, & Ali, 2011; Mattick, Breen, Kimber, & Davoli, 2009), injection drug use and equipment-sharing (Gowing et al., 2011), and HIV transmission (Ahamad et al., 2015). A Cochrane review found a non-significant trend of reductions in mortality associated with methadone maintenance treatment (MMT) (Mattick et al., 2009). Moreover, Brugal et al. (2005) reported a seven-fold increased risk of overdose death while not in MMT in a cohort study of heroin users. These findings are especially pertinent given the recent increase in opioid use-related overdose deaths in North American jurisdictions (British Columbia Coroners Service, 2017; Rudd, Aleshire, Zibbell, & Gladden, 2016). In Vancouver, Canada, the drug use-related overdose death rate more than tripled between 2012 and 2016 (British Columbia Coroners Service, 2017) and has overwhelmed first responders (CTV News, 2016).

Homeless people are particularly vulnerable to substance use-related harms, as inadequate/unstable housing can be a significant structural determinant of risk behaviors (Aidala, Cross, Stall, Harre, & Sumartojo, 2005). Homelessness is independently associated with needle use and sharing (Aidala et al., 2005) as well as nonfatal drug overdose (Fischer et al., 2004). A study from Boston, Massachusetts, reported opioid overdose as a major cause of death among homeless adults (Baggett et al., 2013). MMT thus has strong potential as a treatment and prevention tool among homeless people experiencing opioid dependence.

Abbreviations: MMT, methadone maintenance treatment; MPR, medication possession ratio; VAH, Vancouver At Home; BC, British Columbia; MSP, Medical Services Plan

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Poor adherence to MMT increases the risk of overdose through changes to the central nervous system (Wolff, 2002). However, MMT adherence research is limited (Roux et al., 2014). Existing studies have generally used shorter observation periods ranging from a week to over 2 years (Haskew, Wolff, Dunn, & Bearn, 2008; Raffa et al., 2007; Roux et al., 2014; Shen et al., 2016; Zhao, Holzemer, Tulsky, Johnson, & Dawson Rose, 2014), and, in one case, eight years (Zhou, Li, Wei, Li, & Zhuang, 2017). Longer observation periods may enable more stable estimates of adherence. Moreover, to our knowledge, no studies have reported adherence to MMT among homeless populations.

The current study addresses the aforementioned gaps by being the first to investigate methadone adherence in a well-defined sample of people experiencing both homelessness and mental illness over a period of 15 years using comprehensive pharmacy dispensing data. Our objectives were to identify the prevalence of MMT within the sample, investigate adherence levels over a multi-year period, report characteristics that may differentiate methadone recipients from others in the sample, and identify potential correlates of adherence. Such information is needed to inform MMT programs serving homeless populations and future research, as the level of MMT adherence in this population remains unknown. Cost-effectiveness studies are also important in this area, but at this point, there are very few studies with descriptive details involving MMT among marginalized samples, so an additional goal of the present study was to contribute descriptive information related to cost of MMT, to inform future research.

2. Material and methods

2.1. Data sources and participants

Analysis was based on administrative and self-reported data from participants in the Vancouver At Home (VAH) study. VAH is comprised of two randomized trials of Housing First interventions for homeless adults experiencing mental illness in Vancouver, British Columbia (BC) (Somers et al., 2013). Participants were recruited between October 2009 and June 2011, and met the following inclusion criteria: a minimum age of 19, absolute homelessness or unstable housing, and mental illness. Absolute "homelessness was defined as having no fixed place to sleep or live for more than 7 nights and little likelihood of obtaining accommodation in the coming month" (Somers et al., 2013, p. 3). Unstable "housing was defined as currently residing in marginal accommodation, such as a SRO hotel, and having two or more episodes of [absolute] homelessness (as defined above) during the past 12 months" (Somers et al., 2013, p. 3). Comprehensive diagnostic and prescription data were obtained from BC's Medical Services Plan (MSP) (Government of British Columbia, 2017a) and BC PharmaNet (Government of British Columbia, 2017c). MSP is the universal health insurance plan in British Columbia (Government of British Columbia, 2017a). PharmaNet is an administrative database containing information related to prescription drug dispensation from all pharmacies in BC (Government of British Columbia, 2017c).

Separate consent was required for 1) participation in VAH and 2) access to administrative records, including MSP and PharmaNet data. The Institutional ethics review board of Simon Fraser University approved the current study. Further details unrelated to the present study have been described separately (Rezansoff, Moniruzzaman, Fazel, Procyshyn, & Somers, 2016; Somers et al., 2013).

Baseline data from VAH and descriptive longitudinal data from MSP and PharmaNet were analyzed. Retrospective PharmaNet data were available from January 1, 1996 to VAH baseline ($\approx$ 15 years). All participants dispensed methadone between January 1, 1996 and baseline were included in analyses. A diagnosis of "drug dependence" occurring at any point during the 15 years preceding VAH baseline was identified from MSP billing data. Drug dependence can be entered into MSP by any community-based health care practitioner qualified to diagnose, using the International Classification of Diseases-9 code of 304.

2.2. MMT adherence and descriptive variables

Methadone treatment in BC is prescribed by MMT-authorized physicians (College of Physicians and Surgeons of British Columbia, 2016). Daily oral methadone is administered at pharmacies, and consumption is observed by pharmacists, unless take-home doses are prescribed (College of Physicians and Surgeons of British Columbia, 2016). MMT is provided at no cost via a provincially sponsored plan (known as BC PharmaCare) to low-income patients (Government of British Columbia, 2017b).

Adherence to methadone was measured using the medication possession ratio (MPR) and derived from administrative prescription data (PharmaNet). MPR is a validated (Steiner, Koepsell, Fihn, & Inui, 1988) and well-established metric for adherence and has been used to measure long-term adherence in homeless mentally ill samples (Rezansoff, Moniruzzaman, Fazel, McCandless, et al., 2016; Rezansoff, Moniruzzaman, Fazel, Procyshyn, et al., 2016). MPR indicates the ratio between the number of days of medication dispensed in a given time interval to the number of days in that interval. Drug costs, dispensing fees, and number of pharmacy transactions were determined separately (per person-year). PharmaCare billings and out-of-pocket patient expenses were also calculated.

Socio-demographic information was collected via questionnaires at recruitment. This also included information related to homelessness, such as age first homeless, lifetime duration of homelessness, and housing status (absolutely homeless or unstably housed). Twenty-nine chronic physical health conditions, diseases, and infections (e.g., HIV) were included in the VAH protocol. Mental disorders were categorized as being in the "less severe cluster" (includes: major depressive episode, post-traumatic stress disorder, and panic disorder) or "severe cluster" (includes: manic or hypomanic episode, mood disorder with psychotic features, and psychotic disorder). In addition to age of first alcohol and drug use, participants were asked if they had engaged in a range of substance use behaviors occurring in the previous month. Instrument details and information regarding methods of administration have been published (Somers et al., 2013).

2.3. Statistical analysis

Percentages were used to present results for each categorical variable. Descriptive statistics were presented for continuous variables.

The observation period used to assess adherence (MPR) consisted of the length of time (in days) between the date of first dispense (any time between January 1, 1996 and the baseline interview) and the date of the baseline interview. Continuous indication for MMT was assumed (Nosyk et al., 2012).

Independent sample *t*-tests (for categorical variables with two levels, such as gender and education) and one-way ANOVA (for categorical variables with more than two levels, such as ethnicity and lifetime duration of homelessness) were conducted to test for differences in MPR between levels of a variety of variables, including socio-demographic, homelessness, physical health, mental disorder, and substance use characteristics. All reported p values were two sided. The conventional $p \leq 0.05$ was chosen to determine significance. Due to a small sample size, $p \leq 0.10$ was also used to indicate a significant trend.

3. Results

Baseline interviews for VAH were conducted with 497 participants, and 433 (87.1%) provided consent for researchers to access administrative data (Table 1). PharmaNet records showed that methadone was dispensed to 78 participants (18.0%), of whom all but one had a diagnosis of drug dependence in MSP.

Approximately 40% of participants who received methadone identified as women. The majority were between the ages of 25 and 44 years (66.7%), White (60.3%), had not completed high school (66.7%), and