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Utilization of opioid agonist therapy among incarcerated persons with opioid use disorder in Vancouver, Canada

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Abstract

Background: Inability to access opioid agonist therapy (OAT) in correctional settings has previously been reported in Vancouver, Canada, and is associated with harms among people with opioid use disorder (OUD), including overdose death. We investigated the prevalence and correlates of OAT utilization within correctional settings among incarcerated persons with OUD in Vancouver.

Methods: Data were derived from three prospective cohorts of people who use drugs in Vancouver between 2005 and 2016. Using multivariable generalized estimating equations, we examined factors associated with OAT utilization among participants with OUD reporting incarceration in the past six months.

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Contributors

All authors have contributed materially in the research or manuscript preparation. NB and KH conceived of the study concept and design and drafted the manuscript. EN contributed to statistical analysis and drafting of the manuscript. KD, MJM, EW and NF provided edits to the manuscript. All authors read and approved the final manuscript.

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Conflict of Interest
None declared.

Results: Among 597 eligible participants, 207 (34.7%) contributed 325 reports of having utilized OAT while incarcerated. Of those, 295 (90.8%) were continuations and 30 (9.2%) were new initiations of OAT while incarcerated. For those currently on OAT (at the time of interview), in multivariable analyses, non-fatal overdose (adjusted odds ratio [AOR]=0.49, 95% confidence interval [CI]: 0.29–0.82) and daily prescription opioid use (AOR=0.42, 95% CI: 0.20–0.85) remained independently and negatively associated with having utilized OAT while incarcerated. For those not currently on OAT, none of the variables considered had significant associations with utilization of OAT while incarcerated.

Conclusions: Utilization of OAT in correctional settings was low in our sample. Utilization of OAT was significantly and negatively associated with overdose and ongoing prescription opioid misuse if OAT was continued upon release from correctional settings. Findings underscore the urgent need for improved utilization of OAT in correctional settings, and linkage to community care to prevent harms such as overdose.

Keywords

opioid agonist therapy; incarceration; opioid use disorder; overdose; British Columbia

1. Introduction

Vancouver, British Columbia (BC), Canada, like many areas in North America, is currently struggling with an opioid overdose crisis. Across the province, 931 unintentional overdose deaths related to illicit drugs were reported in 2016 (61.8% involving fentanyl), an increase from 531 in 2015, and 341 in 2014 (British Columbia Coroners Service, 2017a), prompting the Provincial Health Officer to declare a public health emergency in April 2016. In spite of this measure, the number of opioid overdose deaths increased another 43% in 2017 (British Columbia Coroners Service, 2017b).

People with substance use disorders are over-represented in corrections systems, with 69% of Canadian federal inmates reporting substance abuse problems (Kunic and Grant, 2006). Nine percent of men and 16% of women in federal correctional institutions reported injecting opioids in the six months prior to incarceration (Zakaria et al., 2010) and similarly, in provincial correctional settings, 7.5% reported using heroin and 35.3% reported using other opioids in the year prior to incarceration (Kouyoumdjian et al., 2014). It is well documented that illicit opioid use persists in correctional facilities (Small, 2005; Wood et al., 2006a), with 10–20% of incarcerated persons testing positive for opioids on random urine drug screening (Kendall and Pearce, 2000). Release from correctional settings has been associated with an increased risk of overdose death in multiple settings (Binswanger et al., 2013; Binswanger et al., 2007; Bird and Hutchinson, 2003; Farrell and Marsden, 2008; Groot et al., 2016; Kouyoumdjian et al., 2016) presumably due to involuntary detoxification of opioid-dependent clients while incarcerated and resultant loss of tolerance (Binswanger et al., 2012; Strang et al., 2003; Tagliaro et al., 1998). Therefore, ensuring access to opioid agonist therapy (OAT) for people with opioid use disorder (OUD) in these settings is important to address the ongoing opioid overdose crisis.

Unlike many U.S. and other Canadian jurisdictions (Wakeman and Rich, 2015), in federal and provincial correctional facilities in BC, OAT can be initiated for persons with OUD, or continued for those already prescribed OAT prior to incarceration. Methadone maintenance therapy (MMT) has been available in provincial correctional settings in BC since 2002 and buprenorphine/naloxone has been available since 2010 (Burgmann, 2016). However, according to media reports, many incarcerated persons had reported being unable to access OAT while incarcerated (Burgmann, 2016), placing them at risk of unintentional overdose while incarcerated and upon release. In provincial correctional settings, a private corporation administered health care services prior to September 2017. Under the corporation, policy documents indicate that “patients who are suitable and have requested to participate in the BC Suboxone or Methadone Maintenance Programs are evaluated according to the criteria outlined in the most recent version of the Methadone Guideline, published by the College of Physicians and Surgeons of BC” (Chiron Health Services Inc., 2016). However, clients must self-identify as requiring OAT during an initial health assessment or other clinical encounter, and the nurse then books an appointment with a physician based on a priority system; pregnancy, debilitating illness, comorbid HIV/HCV, injection drug use, and individuals started on Suboxone taper protocols who wish to stay on OAT are given highest priority (Chiron Health Services Inc., 2016). Additionally, there are no minimum time requirements stipulated for accessing a prescribing physician following completion of a priority assessment (Chiron Health Services Inc., 2016). Furthermore, the absence of needle and syringe and other harm reduction programs in correctional settings also places individuals at risk of acquiring blood-borne infections, such as HIV and hepatitis C virus (HCV; Small, 2005). Given the known harms associated with untreated OUD in the correctional system, and the fact that OAT is, in theory, available to all people held in federal and provincial correctional facilities in BC, our setting presents a unique opportunity to explore gaps in care delivery and its potential contribution to the overdose crisis in this setting. In this exploratory study, we aimed to investigate the prevalence and correlates of OAT utilization within correctional settings among incarcerated persons with OUD in Vancouver, BC.

2. Material and methods

2.1. Participants

Data for this study were obtained from the At-Risk Youth Study (ARYS), the AIDS Care Cohort to evaluate Exposure to Survival Services (ACCESS) and the Vancouver Injection Drug Users Study (VIDUS), three ongoing, open prospective cohort studies of people who use drugs in Vancouver, Canada. These cohorts have been described in detail previously (Tyndall et al., 2003; Wood et al., 2006b). Briefly, snowball sampling and extensive street-based outreach methods were employed to recruit participants for all three studies. To be eligible for ARYS, participants had to be aged 14–26 years at enrollment, use illicit drugs other than or in addition to marijuana in the past month, be street-involved, reside in the greater Vancouver area, and provide written informed consent. Youth who were homeless or using services for homeless youth were considered “street-involved” in this study. To be eligible for ACCESS, participants had to be HIV-positive, and report using an illicit drug other than or in addition to cannabis in the past month. To be eligible for VIDUS, participants had to be HIV-negative and report injecting a drug at least once in the month

preceding enrollment. For both ACCESS and VIDUS, participants had to be aged 18 or older at the time of enrollment, reside in the greater Vancouver area, and provide written informed consent. All three cohorts employed harmonized data collection and follow-up procedures to allow for combined analyses. Specifically, at enrolment, and every six months, participants completed harmonized interviewer-administered questionnaires that included questions related to demographic information, drug use patterns and other behaviors and exposures, and provided blood samples tested for HIV (for HIV-negative individuals), HIV clinical monitoring (for people living with HIV) and HCV antibodies. At each study visit, participants were provided with a stipend (\$30 CDN) for their time. The University of British Columbia/Providence Health Care Research Ethics Board approved the studies.

For the present analysis, participants were included if they had completed an interview between September 2005 and May 2016. Because we were interested in understanding utilization of OAT for those with OUD while incarcerated, the sample was restricted to those observations where incarceration in the past six months was reported, defined as having been in prison, jail or detention (yes vs. no) and to cases where OUD was presumed. In this case, OUD was presumed if the participant reported at least daily use of any illicit opioids (including non-medical use of prescription opioids), or were on OAT (i.e., methadone or buprenorphine/naloxone) in the past six months at the study visit where incarceration was reported, or in the visit immediately prior to the study visit when incarceration was reported. In this way, we aimed to capture all participants eligible for OAT while incarcerated. Baseline data for this analysis were derived from the first visit where incarceration in the last six months was reported.

2.2. Measures

Our outcome of interest was self-reported utilization of OAT (i.e., methadone or buprenorphine/naloxone) while incarcerated (yes vs. no). We selected a range of variables that we hypothesized might be associated with utilization of OAT while incarcerated. Socio-demographic characteristics included: age (per 10 years older); sex (female vs. male); and ethnicity (white vs. other). Substance use patterns included heavy alcohol use; daily cocaine use; daily crack cocaine use; daily crystal methamphetamine use; daily heroin use; and daily prescription opioid use (all yes vs. no, all by any route). Heavy alcohol use was defined according to the National Institute on Alcohol Abuse and Alcoholism (NIAAA) criteria for “heavy” or “at-risk” drinking: an average of >3 alcoholic drinks per occasion or >7 drinks per week in the past six months for women, and an average of >4 alcoholic drinks per occasion or >14 drinks in total per week in the past six months for men (NIAAA, 2005). Drug use patterns while incarcerated included: use of heroin; cocaine; and crystal methamphetamine (all yes vs. no, all by any route). Other variables considered included: non-fatal overdose; hepatitis C virus seropositivity; and reported syringe sharing (all yes vs. no). We also included a variable indicating cohort designation (VIDUS vs. ACCESS vs. ARYS). All drug use and behavioral variables referred to activities or experiences in the past six months and were treated as time-varying variables.

2.3. Analyses

First, we compared the baseline sample characteristics among those who did and did not utilize OAT while incarcerated at least once during the study period by using Pearson's Chi-square test (for categorical variables) and the Wilcoxon rank sum test (for continuous variables). Fisher's exact test was used when one or more of the cells contained expected values less than or equal to five.

Next, in order to identify a set of variables that best explain a higher or lower odds of utilizing OAT while incarcerated, we employed multivariable generalized estimating equations (GEE) with logit-link function, which provided standard errors adjusted by multiple observations per person using an exchangeable correlation structure. Further, given that the factors potentially associated with utilization of OAT while incarcerated may change depending on whether or not OAT was discontinued after being released from correctional settings, we stratified the analysis by whether the participant reported being on OAT at the time of interview (yes vs. no). To fit our multivariable GEE models, we used an a priori-defined backward model selection process based on the examination of quasiliikelihood under the independence model criterion statistic (QIC). In brief, all variables significant at the $p < 0.10$ threshold in bivariable analyses were entered in a full multivariable GEE model. After examining the QIC value of the models, the variable with the largest p -value was removed and a reduced model was built. This iterative process was continued until a model with the lowest QIC value was selected. All statistical analyses were performed using R, version 3.2.4 (R Foundation for Statistical Computing, Vienna, Austria). All p -values are two sided.

3. Results

In total, 597 individuals met the eligibility criteria of having presumed opioid use disorder and reporting incarceration in the last six months. These individuals completed a median of two (interquartile range [IQR]: 1–3) study visits involving a report of incarceration in the last six months, and contributed 1251 observations to the present analysis. The median number of days incarcerated for each observation was 20 (IQR: 3–60) days. The majority ($n=576$; 96.5%) had a history of injection drug use at baseline. Baseline data stratified by utilization of OAT while incarcerated are reported in Table 1. As shown, the median age of our sample at baseline was 35.9 years (IQR: 26.8–43.3), 194 (32.5%) were female, and 362 (60.6%) self-reported white ethnicity. At baseline, 420 (70.4%) participants reported daily heroin use and 102 (17.1%) reported daily prescription opioid use in the last six months.

A total of 207 (34.7%) participants reported having utilized OAT while incarcerated at some point during the study period. Of the 1251 observations, only 325 (26.0%) included a report of utilizing OAT while incarcerated. Among them, 295 (90.8%) were continuations on OAT and only 30 (9.2%) were new initiations of OAT. Among those who continued their OAT, the median number of days participants waited prior to receiving their first dose was two days (IQR: 1–3). Among those who started OAT while incarcerated, the most common duration to wait was 2–3 days. Among the 325 observations where OAT while incarcerated in the last six months was reported, 167 (51%) observations included a report of current community

supervision defined as bail, conditional sentencing, diversion, parole or probation, while 107 (33%) reported no community supervision and the remainder did not respond.

The location of detention as well as the proportion of observations in each location with a report of OAT utilization is reported in Table 2. Most observations involved a report of being detained in provincial correctional settings (654 observations). Fifty percent of those observations in federal correctional settings also involved a report of utilizing OAT while 35.3% and 14.7% of those observations in provincial and local correctional settings respectively involved a report of OAT utilization.

The results of bivariable and multivariable GEE analyses stratified by current OAT status are presented in Table 3. For those participants currently on OAT (at the time of interview), in multivariable analyses, non-fatal overdose (adjusted odds ratio [AOR]=0.49 95% confidence interval [CI]: 0.29–0.82) and daily prescription opioid use (AOR=0.42, 95% CI: 0.20–0.85) remained independently and negatively associated with having utilized OAT while incarcerated. For those participants not currently on OAT, none of the variables considered had significant associations with the outcome.

Table 4 provides details regarding the frequency of observations involving a report of prescription opioid use and non-fatal overdose stratified by OAT utilization while incarcerated and at current visit. Utilizing OAT while incarcerated and on release is associated with the lowest proportion of reports of daily prescription opioid use and non-fatal overdose.

4. Discussion

Our results demonstrate that, although people with OUD can access OAT in correctional settings in BC in theory, it is poorly utilized in practice. Of the 1251 observations involving a report of incarceration who presumably had OUD in our study, only 325 (26.0%) included a report of OAT utilization. This is consistent with data from European jurisdictions where two recent reviews revealed that less than 16% of people who use opioids were offered OAT (Larney and Dolan, 2009; Stover and Michels, 2010) in correctional settings that purported to support its use. Our results also demonstrated that among persons who did utilize OAT in correctional settings, the majority (90.8%) were continuations rather than new OAT starts. This indicates that in some cases, prescriptions for OAT are being continued but the more difficult work of identifying and diagnosing OUD is not being undertaken. Barriers to accessing health services in correctional settings have been well-documented and include long wait lists, under-skilled or non-empathic healthcare staff, and a lack of continuity of care (Plugge et al., 2008; Rabia et al., 2016). Barriers to OAT identified in European correctional settings with access to OAT on paper, include restrictive entrance criteria (for example OAT being limited to persons jailed for a particular length of time or age), and limitations of trained health personnel (Stover and Michels, 2010). It is not possible to infer from our results the barriers to new OAT starts in correctional settings in BC. However, greater institutional acknowledgement of gaps in treatment engagement and ensuring that skilled addiction medicine providers are in all corrections settings can be expected to improve OAT uptake among individuals with OUD and support overdose prevention efforts.

Echoing previous work (Bird et al., 2015; Degenhardt et al., 2014; Green et al., 2018; Marsden et al., 2017) we found that for those on OAT at the time of interview, having utilized OAT while incarcerated was negatively associated with non-fatal overdose and daily prescription opioid use. This finding raises questions about the ethics of failing to adequately support OAT initiation among incarcerated individuals with OUD in BC, other Canadian provinces, and jurisdictions in the United States, particularly as the opioid crisis intensifies.

Our results also demonstrate that the protective effects of OAT utilization in correctional settings disappeared if OAT is discontinued post-incarceration, which is consistent with studies demonstrating benefits of retention in OAT post-incarceration (Dolan et al., 2005; Hedrich et al., 2012). The OAT policy from provincial correctional settings during the study period does emphasize the importance of OAT continuation after release, and recommends that clients be encouraged and assisted in returning to their community prescriber or sourcing a new prescriber on release and provision of a two-week release prescription (Chiron Health Services Inc., 2016). However, coordinated aftercare planning for persons on OAT while incarcerated is difficult. A major barrier includes clients transitioning from private to public health care systems where personal health records are not shared. Additionally, clients in pre-trial settings may be released following a court appearance without prior notice, interfering with a physicians' ability to assess a client and provide an OAT prescription prior to release. Fragmentation of care on discharge has previously been identified as a major barrier to care for incarcerated persons (Rabia et al., 2016), and our work highlights the importance of ensuring smooth transitions to community health care providers on discharge from correctional settings. Care-transition programs are already well described (although rarely implemented) for persons receiving HIV treatment and women receiving prenatal care (Lincoln et al., 2006; Myers et al., 2017). These may shed light on possible models of transitional care including employing physicians who work dually in correctional settings and in community (Lincoln et al., 2006), team-based discharge planning, intensive case management and the utilization of patient navigators (Koester et al., 2014; Myers et al., 2017). The recent transition of medical health services in the provincial correctional system from a private corporation to the publicly-funded Provincial Health Services Authority in September 2017 has the potential to facilitate improved care in correctional settings and improved discharge planning by bringing health care provision under a single public healthcare system framework. Additionally, newly implemented policies and procedures at the provincial level that have potential to improve utilization of OAT include provision of OAT by the next day of admission to the facility (and same day in the context of clinical opioid withdrawal), provision of a prescription for OAT on discharge, having the correctional setting healthcare team liaise with a community prescriber to facilitate an OAT prescription if released without notice, as well as overdose education and take home naloxone kit distribution prior to release. Similar provisions should be implemented in other detention locations such as the local and federal systems.

There are a number of limitations to this study. First, the reliability of our results may be limited by the fact that we did not conduct structured diagnostic interviews to make a diagnosis of OUD. Instead, we assumed that those who used illicit opioids at least daily, or reported current opioid agonist therapy had a diagnosis of OUD. Nevertheless, given the fact that (70.4%) participants reported daily heroin use and 102 (17.1%) reported using illicit

prescription opioids daily, we believe that our inclusion criteria were conservative. Another limitation is that we were not able to capture those participants who were offered OAT but declined, nor those participants for whom OAT may have been medically contraindicated. Further, participants who died from overdose would also not be captured; however, this would bias our results toward the null. Unfortunately, our data was also limited by the fact that not all participants had completed a study visit immediately prior to the visit in which incarceration was reported. It is therefore not possible to ascertain the number of participants who were accessing OAT prior to incarceration. Our findings are also subject to response biases as a limitation of using self-report surveys; however, previous work has found that self-reporting among people who use drugs is generally congruent with actual behavior (Brener et al., 1995; Darke, 1998; Rosenbaum, 2009) and we expect that any response biases from participants in this study would underestimate the prevalence of drug use and therefore bias our results towards the null. Finally, since our sample was not recruited at random from correctional institutions, our findings may not be generalizable to all persons with OUD who are incarcerated.

5. Conclusion

In conclusion, utilization of OAT in correctional settings was low in our sample. Utilization of OAT while incarcerated was significantly and negatively associated with non-fatal overdose and ongoing prescription opioid use if OAT was continued upon release from correctional settings. Our findings underscore the urgent need for improved utilization of OAT in correctional settings, and the importance of linkage to community-based OAT programs upon release to prevent harms such as overdose.

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References

- Binswanger IA, Blatchford PJ, Mueller SR, Stern MF, 2013 Mortality after prison release: Opioid overdose and other causes of death, risk factors, and time trends from 1999 to 2009. *Ann. Intern. Med* 159, 592–600. [PubMed: 24189594]
- Binswanger IA, Nowels C, Corsi KF, Glanz J, Long J, Booth RE, Steiner JF, 2012 Return to drug use and overdose after release from prison: A qualitative study of risk and protective factors. *Addict. Sci. Clin. Pract* 7, 3. [PubMed: 22966409]

- Binswanger IA, Stern MF, Deyo RA, Heagerty PJ, Cheadle A, Elmore JG, Koepsell TD, 2007 Release from prison--a high risk of death for former inmates. *N. Engl. J. Med* 356, 157–165. [PubMed: 17215533]
- Bird SM, Fischbacher CM, Graham L, Fraser A, 2015 Impact of opioid substitution therapy for Scotland's prisoners on drug-related deaths soon after prisoner release. *Addiction* 110, 1617–1624. [PubMed: 25940815]
- Bird SM, Hutchinson SJ, 2003 Male drugs-related deaths in the fortnight after release from prison: Scotland, 1996–99. *Addiction* 185–190. [PubMed: 12534423]
- Brener ND, Collins JL, Kann L, Warren CW, Williams BI, 1995 Reliability of the Youth Risk Behavior Survey Questionnaire. *Am. J. Epidemiol* 141, 575–580. [PubMed: 7900725]
- British Columbia Coroners Service, 2017a Illicit Drug Overdose Deaths in BC January 1, 2007 – March 31, 2017. BC Coroners Service, Burnaby, BC.
- British Columbia Coroners Service, 2017b Illicit Drug Overdose Deaths in BC January 1, 2007 – August 31, 2017. BC Coroners Service, Burnaby, BC.
- Burgmann T, 2016 B.C. prisoners get addiction therapy after settlement in Charter challenge. *The Globe and Mail*. <https://www.ctvnews.ca/health/b-c-prisoners-get-addiction-therapy-after-settlement-in-charter-challenge-1.2861963>.
- Chiron Health Services Inc., 2016 Health Care Clinical Guidelines: Partnering in a Correctional Environment.
- Darke S, 1998 Self-report among injecting drug users: A review. *Drug Alcohol Depend.* 51, 253–263. [PubMed: 9787998]
- Degenhardt L, Larney S, Kimber J, Gisev N, Farrell M, Dobbins T, Weatherburn DJ, Gibson A, Mattick R, Butler T, Burns L, 2014 The impact of opioid substitution therapy on mortality post-release from prison: retrospective data linkage study. *Addiction* 109, 1306–1317. [PubMed: 24612249]
- Dolan KA, Shearer J, White B, Zhou J, Kaldor J, Wodak AD, 2005 Four-year follow-up of imprisoned male heroin users and methadone treatment: Mortality, re-incarceration and hepatitis C infection. *Addiction* 100, 820–828. [PubMed: 15918812]
- Farrell M, Marsden J, 2008 Acute risk of drug-related death among newly released prisoners in England and Wales. *Addiction* 103, 251–255. [PubMed: 18199304]
- Green TC, Clarke J, Brinkley-Rubinstein L, Marshall BDL, Alexander-Scott N, Boss R, Rich JD, 2018 Postincarceration fatal overdoses after implementing medications for addiction treatment in a statewide correctional system. *JAMA Psychiatry* 75, 405–407. [PubMed: 29450443]
- Groot E, Kouyoumdjian FG, Kiefer L, Madadi P, Gross J, Prevost B, Jhirad R, Huyer D, Snowdon V, Persaud N, 2016 Drug toxicity deaths after release from incarceration in Ontario, 2006–2013: Review of Coroner's Cases. *PLoS One* 11, e0157512. [PubMed: 27384044]
- Hedrich D, Alves P, Farrell M, Stover H, Moller L, Mayet S, 2012 The effectiveness of opioid maintenance treatment in prison settings: A systematic review. *Addiction* 107, 501–517. [PubMed: 21955033]
- Kendall PR, Pearce M, 2000 Drug testing in Canadian jails: To what end? *Can. J. Public Health* 91, 26–28. [PubMed: 10765575]
- Koester KA, Morewitz M, Pearson C, Weeks J, Packard R, Estes M, Tulskey J, Kang-Dufour MS, Myers JJ, 2014 Patient navigation facilitates medical and social services engagement among HIV-infected individuals leaving jail and returning to the community. *AIDS Patient Care STDS* 28, 82–90. [PubMed: 24517539]
- Kouyoumdjian FG, Calzavara LM, Kiefer L, Main C, Bondy SJ, 2014 Drug use prior to incarceration and associated socio-behavioural factors among males in a provincial correctional facility in Ontario, Canada. *Can. J. Public Health* 105, e198–202. [PubMed: 25165839]
- Kouyoumdjian FG, Kiefer L, Wobeser W, Gonzalez A, Hwang SW, 2016 Mortality over 12 years of follow-up in people admitted to provincial custody in Ontario: A retrospective cohort study. *CMAJ Open* 4, E153–E161.
- Kunic D, Grant BA, 2006 The Computerized Assessment of Substance Abuse (CASA): Results from the Demonstration Project. Addictions Research Centre Research Branch Correctional Service of Canada. <http://www.csc-scc.gc.ca/research/r173-eng.shtml>.

- Larney S, Dolan K, 2009 A literature review of international implementation of opioid substitution treatment in prisons: Equivalence of care? *Eur. Addict. Res* 15, 107–112. [PubMed: 19182485]
- Lincoln T, Kennedy S, Tuthill R, Roberts C, Conklin TJ, Hammett TM, 2006 Facilitators and barriers to continuing healthcare after jail: A community-integrated program. *J Ambul. Care. Manage* 29, 2–16. [PubMed: 16340615]
- Marsden J, Stillwell G, Jones H, Cooper A, Eastwood B, Farrell M, Lowden T, Maddalena N, Metcalfe C, Shaw J, Hickman M, 2017 Does exposure to opioid substitution treatment in prison reduce the risk of death after release? A national prospective observational study in England. *Addiction* 112, 1408–1418. [PubMed: 28160345]
- Myers JJ, Koester KA, Kang Dufour MS, Jordan AO, Cruzado-Quinone J, Riker A, 2017 Patient navigators effectively support HIV-infected individuals returning to the community from jail settings. *Int. J. Prison Health* 13, 213–218. [PubMed: 28914126]
- National Institute of Alcohol and Alcoholism (NIAAA), 2005 Helping patients who drink too much: A clinician's guide. National Institutes of Health, United States Department of Health and Human Services. <https://pubs.niaaa.nih.gov/publications/practitioner/cliniciansguide2005/guide.pdf>.
- Pluge E, Douglas N, Fitzpatrick R, 2008 Patients, prisoners, or people? Women prisoners' experiences of primary care in prison: A qualitative study. *Br. J. Gen. Pract* 58, 630–636. [PubMed: 18801272]
- Rabia A, Cybele A, Rebecca M, Diane P, Louanne K, 2016 Access to healthcare services during incarceration among female inmates. *Int. J. Prisoner Health* 12, 204–215.
- Rosenbaum JE, 2009 Truth or consequences: The intertemporal consistency of adolescent self-report on the Youth Risk Behavior Survey. *Am. J. Epidemiol* 169, 1388–1397. [PubMed: 19363096]
- Small WW, 2005 Incarceration, addiction and harm reduction: Inmates experience injecting drugs in prison. *Subst. Use Misuse* 40, 831–843. [PubMed: 15974143]
- Stover H, Michels I, 2010 Drug use and opioid substitution treatment for prisoners. *Harm Reduct. J* 7, 17. [PubMed: 20642849]
- Strang J, McCambridge J, Best D, Beswick T, Bearn J, Rees S, Gossop M, 2003 Loss of tolerance and overdose mortality after inpatient opiate detoxification: Follow up study. *BMJ* 326, 959–960. [PubMed: 12727768]
- Tagliaro F, De Battisti Z, Smith FP, Marigo M, 1998 Death from heroin overdose: Findings from hair analysis. *Lancet* 351, 1923–1925. [PubMed: 9654260]
- Tyndall MW, Currie S, Spittal P, Li K, Wood E, O'Shaughnessy MV, Schechter MT, 2003 Intensive injection cocaine use as the primary risk factor in the Vancouver HIV-1 epidemic. *AIDS* 17, 887–893. [PubMed: 12660536]
- Wakeman SE, Rich JD, 2015 Addiction treatment within U.S. correctional facilities: Bridging the gap between current practice and evidence-based care. *J. Addict. Dis* 34, 220–225. [PubMed: 26076211]
- Wood E, Lim R, Kerr T, 2006a Initiation of opiate addiction in a Canadian prison: A case report. *Harm Reduct. J* 3, 11. [PubMed: 16542427]
- Wood E, Stoltz JA, Montaner JS, Kerr T, 2006b Evaluating methamphetamine use and risks of injection initiation among street youth: the ARYS study. *Harm Reduct. J* 3, 18. [PubMed: 16723029]
- Zakaria D, Thompson JM, Jarvis A, Borgatta F, 2010 Summary of emerging findings from the 2007 National Inmate Infectious Diseases and Risk-Behaviours Survey. Correctional Service Canada, Government of Canada. <http://www.csc-scc.gc.ca/research/005008-0211-01-eng.shtml>.

Highlights

- Utilization of opioid agonist therapy (OAT) in correctional settings in Vancouver remains low
- Most utilizing OAT were continuations rather than new initiations on the medication
- Utilizing OAT was negatively associated with overdose if continued on release

Table 1.

Baseline characteristics of incarcerated people with OUD, stratified by having utilized OAT while incarcerated (n=597).

Characteristic		Total (%) N= 597	Ever utilized OAT while incarcerated		p-value
			Yes (%) N= 207	No (%) N=390	
Age (median [IQR]) [€]		35.9 (26.8–43.3)	37.1 (29.2–43.9)	34.6 (26.2–42.8)	0.024
Female		194 (32.5)	60 (29.0)	134 (34.4)	0.182
White		362 (60.6)	119 (57.5)	243 (62.3)	0.251
Heavy alcohol use [*]		80 (13.4)	26 (12.6)	54 (13.8)	0.652
Daily cocaine use ^{*θ}		78 (13.1)	31 (15.0)	47 (12.1)	0.324
Daily crack use ^{*θ}		282 (47.2)	107 (51.7)	175 (44.9)	0.100
Daily crystal methamphetamine use ^{*θ}		94 (15.7)	25 (12.1)	69 (17.7)	0.073
Daily prescription opioid use ^{*θ}		102 (17.1)	26 (12.6)	76 (19.5)	0.032
Daily heroin use ^{*θ}		420 (70.4)	128 (61.8)	292 (74.9)	0.001
Heroin use while incarcerated ^{*θ}		44 (7.4)	18 (8.7)	26 (6.7)	0.367
Cocaine use while incarcerated ^{*θ}		43 (7.2)	21 (10.1)	22 (5.6)	0.043
Crystal meth use while incarcerated ^{*θ}		19 (3.2)	4 (1.9)	15 (3.8)	0.205
Non-fatal overdose [*]		109 (18.3)	32 (15.5)	77 (19.7)	0.197
Syringe sharing [*]		74 (12.4)	26 (12.6)	48 (12.3)	0.947
Hepatitis C positive		473 (79.2)	174 (84.1)	299 (76.7)	0.034
Cohort	ARYS	134 (22.5)	31 (15.0)	103 (26.4)	0.010
	VIDUS	323 (54.1)	123 (59.4)	200 (51.3)	
	ACCESS	140 (23.5)	53 (25.6)	87 (22.3)	

^{*} Refers to activities in the last six months

^θ Refers to substance use by any route (IV, oral, intranasal, smoked)

[€] refers to continuous variable, p-value is generated from Wilcoxon rank-sum test

ACCESS: AIDS Care Cohort to evaluate Exposure to Survival Services; ARYS: At-Risk Youth Study; IQR: interquartile range; OAT: opioid agonist therapy; OUD: opioid use disorder; VIDUS: Vancouver Injection Drug Users Study

Table 2.

OAT utilization by location of detention

Location of detention	Total observations N=325	Observations involving a report of OAT utilization N (%)
Not reported	53	3 (5.7)
Federal	24	12 (50)
Local	497	73 (14.7)
Provincial	654	231 (35.3)
Youth detention center	23	6 (26.1)

Bivariate and multivariable GEE analysis of factors associated with utilizing OAT while incarcerated among people with OUD stratified by current OAT status

Table 3.

Characteristic	Currently on OAT N observations= 488						Not currently on OAT N observations= 759		
	Unadjusted			Adjusted			Unadjusted		
	Odds Ratio	p-value		Odds Ratio (95% CI)	p-value		Odds Ratio	p-value	
Age $\leq$ (per 10 years older)	1.10 (0.90–1.35)	0.363					1.01 (0.70–1.46)	0.971	
Female	0.68 (0.45–1.03)	0.068		0.67 (0.44–1.01)	0.058		0.81 (0.39–1.69)	0.578	
White	0.74 (0.49–1.10)	0.134					0.85 (0.45–1.62)	0.628	
Heavy alcohol use *	1.00 (0.57–1.73)	0.989					0.94 (0.39–2.29)	0.897	
Daily cocaine use $^{\theta}$	1.43 (0.84–2.44)	0.193					0.89 (0.36–2.24)	0.807	
Daily crack use $^{\theta}$	0.85 (0.58–1.24)	0.401					0.95 (0.50–1.80)	0.881	
Daily crystal meth use $^{\theta}$	0.89 (0.50–1.56)	0.675					1.80 (0.85–3.81)	0.125	
Daily prescription opioid use $^{\theta}$	0.39 (0.20–0.76)	0.005		0.42 (0.20–0.85)	0.017		0.82 (0.38–1.81)	0.630	
Daily heroin use $^{\theta}$	0.69 (0.46–1.03)	0.071					0.79 (0.40–1.54)	0.490	
Any heroin use while incarcerated $^{\theta}$	0.61 (0.29–1.26)	0.183					1.79 (0.76–4.18)	0.181	
Any cocaine use while incarcerated $^{\theta}$	0.94 (0.42–2.13)	0.889					1.98 (0.77–5.12)	0.158	
Any crystal meth use while incarcerated $^{\theta}$	0.37 (0.07–1.85)	0.226					2.23 (0.65–7.68)	0.204	
Non-fatal overdose *	0.46 (0.28–0.76)	0.003		0.49 (0.29–0.82)	0.007		1.57 (0.80–3.07)	0.190	
Hepatitis C positive	1.28 (0.71–2.30)	0.413					1.34 (0.57–3.12)	0.500	
Syringe sharing *	0.55 (0.27–1.10)	0.090					1.61 (0.66–3.92)	0.295	
VIDUS vs. ARYS	0.85 (0.45–1.61)	0.625					0.84 (0.39–1.84)	0.667	
ACCESS vs. ARYS	1.09 (0.55–2.17)	0.813					1.32 (0.50–3.50)	0.576	

* Refers to activities in the last 6 months

$^{\theta}$ Refers to substance use by any route (IV, oral, intranasal, smoked)

“ ϵ ” refers to continuous variable, p-value is generated from Wilcoxon rank-sum test

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ACCESS: AIDS Care Cohort to evaluate Exposure to Survival Services; ARYS: At-Risk Youth Study; IQR: interquartile range; CI: confidence interval; GEE: generalized estimating equations; OAT: opioid agonist therapy; OUD: opioid use disorder; VIDUS: Vancouver Injection Drug Users Study

** 4 observations had missing data about OAT status in one condition and were excluded from the GEE analyses

Table 4.

Daily prescription opioid use and non-fatal overdose stratified by OAT utilization while incarcerated and at current visit

	On OAT during incarceration and at current visit	On OAT during incarceration but not at current visit	No OAT during incarceration but on OAT at current visit	No OAT during incarceration nor at current visit
	N observations = 276 (%)	N observations = 46 (%)	N observations = 212 (%)	N observations = 713 (%)
daily prescription opioid use	12 (4.35)	8 (17.39)	24 (11.32)	142 (19.92)
non-fatal overdose	29 (10.51)	13 (28.26)	44 (20.75)	133 (18.65)

* 4 observations had missing data about OAT status in one condition and were excluded from the GEE analyses