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## Non-Medical Prescription Opioid Use And In-Hospital Illicit Drug Use Among People Who Use Drugs

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### Abstract

**Introduction and Aims:** Illicit drug use while admitted to hospital is common amongst people who use drugs (PWUD). Further, non-medical prescription opioid use (NMPOU) is increasingly being used by this population. This study was undertaken to investigate the relationship between NMPOU and having ever reported using illicit drugs in hospital.

**Design and Methods:** This study was a cross-sectional study design based on data derived from participants enrolled in three Canadian prospective cohort studies between December 2011 and November 2016. Using bivariable and multivariable logistic regression analyses, we examined the relationship between NMPOU and having ever reported illicit drug use in hospital.

**Results:** Among the 1865 participants (951 male, 471 female) enrolled in the studies, 1422 (76.25%) met the inclusion criteria of having ever been hospitalized. Of these, 436 (30.7%) had used illicit drugs while in hospital. In multivariable analyses, after adjusting for various confounders, we found a positive relationship between the percentage of reporting at least daily NMPOU in the past six months during the cohort study period and illicit drug use in hospital (adjusted odds ratio = 3.42; 95% confidence interval: 1.46–8.02).

**Discussion and Conclusions:** Among our sample, more persistent NMPOU was positively associated with having reported in-hospital illicit drug use. Our findings point to the need for better identification and management of opioid use disorder (OUD) in acute care settings to reduce

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CONFLICT OF INTEREST

None to declare

in-hospital illicit drug use, and to offer evidence-based medical treatments to achieve the most optimal outcomes for patients.

### Keywords

addiction; drug overdose/poisoning; drug safety; drug use; health services

## INTRODUCTION

People who use drugs (PWUD) more frequently access health care services as compared to the general population (1). In the United States (US) emergency department use has been found to be 30% higher among PWUD (2), and in Finland the risk of hospitalization is five times higher for PWUD compared to the general population (3). However, the continued use of illicit drugs while being hospitalized among those with active and ongoing substance dependence is also common. One study conducted in Vancouver, Canada found that 44% of people who inject drugs had previously used illicit drugs while in hospital (4). Another study conducted in Lexington, Kentucky, USA found 41% of patients with a history of injection drug use continued to use illicit drugs while being hospitalized for intravenous antibiotic treatment (5).

The growing opioid epidemic and overdose crisis across North America has placed an enormous burden on hospitals and healthcare systems. Between 2001 and 2012, one study found that hospital admissions for both prescription opioid and heroin overdoses increased each year along with associated hospitalization costs (6). Non-medical prescription opioid use (NMPOU) is particularly concerning as data has shown it can contribute to nearly twice as many emergency department visits in the US as compared to heroin (7). Given the high numbers of people using prescription opioids non-medically, with US data showing 18 million in 2017 (8), the hospitalization burden due to these medications is significant. This study was undertaken to investigate the association between NMPOU and reporting in-hospital illicit drug use amongst PWUD in Vancouver, Canada. The findings from this study may highlight an area that could benefit from targeted harm reduction efforts, as well as provide evidence to improve outcomes for PWUD in acute care settings.

## METHODS

### STUDY SAMPLE

The study utilized participant self-reported data from three open prospective cohort studies: the Vancouver Injection Drug Users Study (VIDUS), the AIDS Care Cohort to evaluate Exposure to Survival Services (ACCESS), and the At-Risk Youth Study (ARYS) which have been described in detail elsewhere (9–11). In brief, VIDUS and ACCESS enrolled participants who were 18 years of age or older and resided in the greater Vancouver region. The ACCESS study participants were HIV-positive individuals who used illicit drugs while VIDUS participants used injection drugs the month prior to enrollment and were HIV-negative. ARYS participants were between 14 and 26 years of age at the time of enrollment, street-involved in the greater Vancouver region, and self-reported the use of illicit drugs. At baseline and twice yearly thereafter, participants completed a harmonized

interviewer-administered questionnaire. Participants received a stipend (\$40 CAD) with each study visit to compensate for their time and transportation costs. The University of British Columbia/Providence Health Care's Research Ethics Board approved the studies. The present analysis used data obtained between December 2011 and November 2016 and was restricted to participants who reported having ever experienced at least one admission to in-patient care at a hospital by November 2016.

## VARIABLE SELECTION

The primary outcome of interest for this analysis was having ever used illicit drugs while hospitalized. Participants were asked, "Have you ever been admitted to hospital?", and "Did you ever use street drugs while in hospital?". These questions did not refer to visits to the emergency room. The main exposure of interest was the percentage of at least daily NMPOU in the last six months over the cohort study period (per percent increase). NMPOU was defined as the use of prescription opioids for the experience or feeling they caused or when they were not prescribed to that individual. Given that the present study was a cross-sectional study drawn from a prospective cohort study, percentage data are derived from longitudinal data beginning from the participant's initial date of enrollment to the current study period. For example, if the participant was enrolled in a cohort in December 2011 and reported daily NMPOU in three of the five follow-ups during the study period, then the percentage of daily NMPOU over the study period would be 60%. Herein, this measure is described as "at least daily non-medical prescription opioid use" and was used to account for the fact that the outcome variable was a lifetime measure of illicit drug use in hospital. We also explored a range of factors that have previously been shown to be associated with in-hospital drug use or may potentially confound the relationship of daily NMPOU and illicit drug use (4, 12, 13) : age, sex (male vs. female), injection drug use of any substance, daily heroin use, daily cocaine use, daily methamphetamine use, daily marijuana use, enrollment in opioid agonist therapy, binge drug use, public drug use, and ever having been prescribed insufficient pain medications (yes vs. no). All variables, except for age and sex (time stable covariates), were derived as per percent increase over the study period as was done with our explanatory variable. While our use of proportional variables have not been validated, they have been used in the past (12, 14); nevertheless, this may have led to some residual or unmeasured confounding.

## STATISTICAL ANALYSES

As a first step, we calculated baseline descriptive statistics using Wilcoxon rank-sum tests for continuous variables and chi-square tests for categorical variables, stratified by having a history of in-hospital illicit drugs use. Next, a multivariable logistic regression model was used to estimate the relationship between at least daily NMPOU and in-hospital illicit drug use. As a first step, bivariable analyses were conducted to examine the association between the outcome and each of the exposure variables of interest. Then, a multivariable model was constructed including the primary exposure variable and all confounding variables significantly associated with the outcome in bivariable analyses at  $p < 0.10$ . We quantified the severity of multicollinearity between covariates in the model using the variance inflation factor (VIF). We found no multicollinearity as the VIF was less than 2. All p-values are

two sided. All analyses were conducted in R 3.4.0 (R Foundation for Statistical Computing, Vienna, Austria).

## RESULTS

In total, of 1865 study participants 1422 (76.25%) a history of being hospitalized and were included in the present study: 471 (33.1%) were female and the median age at baseline was 40.6 years (Q1-Q3 30.8–47.1). Among the 1422 participants, 436 (30.7%) individuals reported a history of having used illicit drugs in hospital and the numbers using at least daily NMPOU at baseline was 77 (5.4%). Table 1 shows the baseline characteristics of the study sample stratified by ever having used illicit drugs in hospital.

As indicated in Table 2, in bivariable analyses, at least daily NMPOU was positively associated with having ever used illicit drugs in hospital (odds ratio [OR]=4.52; 95% confidence interval [CI]: 2.07–9.92). Table 2 also shows results from multivariable logistic regression analysis. After controlling for various confounders, including demographics and substance use patterns/behaviours, at least daily NMPOU remained positively associated with having ever used illicit drugs in hospital (adjusted OR [AOR] = 3.42; 95% CI: 1.46–8.02). No significant collinearity between the covariates were detected.

## DISCUSSION

In the present investigation we found that almost one third of PWUD in the study sample had a history of using illicit drugs in hospital. These findings are consistent with previous research in a similar setting indicating a high prevalence of in-hospital illicit drug use amongst PWUD (15, 16). Our findings indicate participants with more persistent NMPOU were more likely to use illicit drugs in hospital. A need to avoid opioid withdrawal may partially explain this observed association. Indeed, enrolment in OAT and public drug use was found to be significantly associated with the outcome variable, both of which may be potential markers of higher severity opioid use. However, the complexities of pain management in hospital settings, particularly for this population, may also be a potential contributing factor.

Interestingly, we failed to find a similar association between frequent heroin use and illicit drug use in hospital. Given that little is known about the differences between the effect of these two opioid classes on use of drugs in acute care settings, future studies should seek to explore and unpack this relationship further. It is notable that more frequent cocaine use was positively associated with illicit use in hospital, which could reflect the drug's shorter half-life and riskier injection behaviours amongst users (17). Future research examining which illicit substances were being used during hospitalization could provide additional context for explaining the associations.

Although we failed to find a statistically significant association between insufficient pain medication and illicit substance use, there was evidence of a weak positive association. This is consistent with previous work that has shown PWUD often feel their pain medication regimes are insufficient in acute care environments (14). In one study nearly half of hospitalized PWUD reported receiving inadequate pain medication, and here it

was positively associated with illicit substance use (15). Furthermore, a recent analysis of prescription opioid dependent patients treated with buprenorphine-naloxone found greater pain severity in a given week was significantly associated with subsequent relapse into opioid use (18).

Our findings of high prevalence of in-hospital illicit drug use highlights the need for improved inpatient addictions care for individuals with SUD. Traditionally, medical education systems have dedicated minimal time to fields such as addiction medicine (19). This has consequences regarding the appropriate treatment and care of patients with SUDs. One study of a group of general internists found that although 47% reported frequently seeing patients with a SUD, only about 7% prescribed treatment medications, and less than 17% referred their patients for any addiction treatment (20). Such missed opportunities are unfortunate especially among those with opioid use disorder (OUD), as evidence-based opioid agonist therapy (OAT) is available in many settings, and studies have shown that hospitals can be an important setting to alter patterns of drug use (21).

There are several limitations to this study. First, we cannot infer causation because of the observational nature of the studies from which our data were extracted. Second, given the nature of observational studies, we cannot assess the temporal order between the explanatory and outcome variables of interest. Indeed, within any given 6-month period, use of illicit substances in hospital could have preceded daily NMPOU. Third, our sample was not randomly recruited and so may not be representative of or generalizable to other PWUD populations. Fourth, our data is obtained via self-reporting and thus the potential for reporting biases, including socially desirable reporting and recall bias exists. Likewise, we were unable to ascertain objective data on participants' medical conditions or diagnoses, which may have influenced the outcome.

In sum, we found that a substantial proportion of hospitalized PWUD in the study sample used illicit drugs while hospitalized. We also found that more persistent NMPOU was associated with increased risk of having used illicit drugs in hospital settings. While more research is needed to distinguish which substances are being used and for which reasons, better identification and management of PWUD, particularly those with OUD, is needed to achieve the best outcomes for patients in acute care settings.

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## REFERENCES

1. French MT, Fang H, Balsa AI. Longitudinal Analysis of Changes in Illicit Drug Use and Health Services Utilization. *Health Services Research*. 2011;46(3):877–99. [PubMed: 21143479]
2. McGeary KA, French MT. Illicit drug use and emergency room utilization. *Health services research*. 2000;35(1 Pt 1):153–69. [PubMed: 10778828]
3. Onyeka IN, Beynon CM, Ronkainen KMS, Tiihonen J, Föhr J, Kuikanmäki O, et al. Hospitalization in a Cohort Seeking Treatment for Illicit Drug Use in Finland. *Journal of Substance Abuse Treatment*. 2015;53:64–70. [PubMed: 25641737]
4. Grewal HK, Ti L, Hayashi K, Dobrer S, Wood E, Kerr T. Illicit drug use in acute care settings. *Drug and Alcohol Review*. 2015;34(5):499–502. [PubMed: 25944526]
5. Fanucchi LC, Lofwall MR, Nuzzo PA, Walsh SL. In-hospital illicit drug use, substance use disorders, and acceptance of residential treatment in a prospective pilot needs assessment of hospitalized adults with severe infections from injecting drugs. *Journal of Substance Abuse Treatment*. 2018;92:64–9. [PubMed: 30032946]
6. Hsu DJ, McCarthy EP, Stevens JP, Mukamal KJ. Hospitalizations, costs and outcomes associated with heroin and prescription opioid overdoses in the United States 2001–12. *Addiction*. 2017;112(9):1558–64. [PubMed: 28191702]
7. SAMHSA (Subst. Abuse Ment. Health Serv. Adm.). 2013. Drug Abuse Warning Network, 2011: National Estimates of Drug-Related Emergency Department Visits. DHHS Publ. No. SMA 13–4760, DAWN Ser. D-39. Rockville, MD: SAMHSA.
8. Center for Behavioral Health Statistics and Quality. Results from the 2017 National Survey on Drug Use and Health: Detailed Tables. Rockville (MD): SAMHSA; 2018. <https://www.samhsa.gov/data/sites/default/files/cbhsq-reports/NSDUHDetailedTabs2017/NSDUHDetailedTabs2017.pdf>. Accessed May 19, 2020.
9. Tyndall MW, Currie S, Spittal P, Li K, Wood E, O'Shaughnessy MV, et al. Intensive injection cocaine use as the primary risk factor in the Vancouver HIV-1 epidemic. *Aids*. 2003;17(6):887–93. [PubMed: 12660536]
10. Stratthdee SA, Palepu A, Cornelisse PGA, Yip B, O'Shaughnessy MV, Montaner JSG, et al. Barriers to Use of Free Antiretroviral Therapy in Injection Drug Users. *JAMA*. 1998;280(6):547–9. [PubMed: 9707146]
11. Wood E, Stoltz JA, Montaner JS, Kerr T. Evaluating methamphetamine use and risks of injection initiation among street youth: the ARYS study. *Harm Reduct J*. 2006;3:18. [PubMed: 16723029]
12. Ti LP, Voon P, Dobrer S, Montaner J, Wood E, Kerr T. Denial of pain medication by health care providers predicts in-hospital illicit drug use among individuals who use illicit drugs. *Pain Research & Management*. 2015;20(2):84–8.
13. Eaton EF, Westfall AO, McClesky B, Paddock CS, Lane PS, Cropsey KL, et al. In-Hospital Illicit Drug Use and Patient-Directed Discharge: Barriers to Care for Patients With Injection-Related Infections. *Open forum infectious diseases*. 2020;7(3):ofaa074–ofaa.
14. Bundy JD, Bazzano LA, Xie D, Cohan J, Dolata J, Fink JC, et al. Self-Reported Tobacco, Alcohol, and Illicit Drug Use and Progression of Chronic Kidney Disease. *Clinical journal of the American Society of Nephrology*. 2018;13(7):993–1001. [PubMed: 29880471]
15. McNeil R, Small W, Wood E, Kerr T. Hospitals as a 'risk environment': An ethno-epidemiological study of voluntary and involuntary discharge from hospital against medical advice among people who inject drugs. 2014.
16. Ti L, Milloy MJ, Buxton J, McNeil R, Dobrer S, Hayashi K, et al. Factors Associated with Leaving Hospital against Medical Advice among People Who Use Illicit Drugs in Vancouver, Canada. 2015.
17. Hudgins R, McCusker J, Stoddard A. Cocaine use and risky injection and sexual behaviors. *Drug and alcohol dependence*. 1995;37(1):7–14. [PubMed: 7882875]

18. Griffin ML, McDermott KA, McHugh RK, Fitzmaurice GM, Jamison RN, Weiss RD. Longitudinal association between pain severity and subsequent opioid use in prescription opioid dependent patients with chronic pain. *Drug and Alcohol Dependence*. 2016;163:216–21. [PubMed: 27161860]
19. Wood E, Samet JH, Volkow ND. Physician Education in Addiction Medicine. *JAMA*. 2013;310(16):1673–4. [PubMed: 24150462]
20. Wakeman SE, Pham-Kanter G, Donelan K. Attitudes, practices, and preparedness to care for patients with substance use disorder: Results from a survey of general internists. *Substance Abuse*. 2016;37(4):635–41. [PubMed: 27164025]
21. Wakeman SE, Metlay JP, Chang Y, Herman GE, Rigotti NA. Inpatient Addiction Consultation for Hospitalized Patients Increases Post-Discharge Abstinence and Reduces Addiction Severity. *Journal of General Internal Medicine*. 2017;32(8):909–16. [PubMed: 28526932]

**Table 1.**Baseline characteristics of people who used illicit drugs in the study sample ( $n = 1422$ )

| Characteristic                                      | Total (%) $n = 1422$ | In-hospital illicit drug use |                   | P-value |
|---|----------------------|------------------------------|-------------------|---------|
|   |                      | Yes (%) 436 (30.7)           | No (%) 986 (69.3) |         |
| <i>Main exposure</i>                                |                      |                              |                   |         |
| At least daily non-medical prescription opioid use* | 77 (5.4%)            | 30 (6.9%)                    | 47 (4.8%)         | 0.10    |
| <i>Covariates</i>                                   |                      |                              |                   |         |
| ARYS cohort   | 224 (15.8%)          | 48 (11.0%)                   | 176 (17.8%)       | <0.01   |
| Age, years (median, Q1–Q3)                          | 40.6 (30.8–47.1)     | 39.4 (32–46.2)               | 41.3 (30.3–47.5)  | 0.09    |
| Male sex  | 951 (66.9%)          | 261 (59.9%)                  | 690 (70.0%)       | <0.01   |
| Injection drug use of any substance*                | 1073 (75.5%)         | 360 (82.6%)                  | 713 (72.3%)       | <0.01   |
| At least daily heroin use*                          | 299 (21.0%)          | 126 (28.9%)                  | 173 (17.5%)       | <0.01   |
| At least daily cocaine use*                         | 124 (8.7%)           | 58 (13.3%)                   | 66 (6.7%)         | <0.01   |
| At least daily crystal methamphetamine use*         | 62 (4.4%)            | 18 (4.1%)                    | 44 (4.5%)         | 0.78    |
| At least daily marijuana use*                       | 362 (25.5%)          | 108 (24.8%)                  | 254 (25.8%)       | 0.71    |
| Enrolment in opioid agonist treatment*              | 483 (34.0%)          | 180 (41.3%)                  | 303 (30.7%)       | <0.01   |
| Binge drug use*                                     | 547 (38.5%)          | 175 (40.1%)                  | 372 (37.7%)       | 0.36    |
| Public drug use*                                    | 402 (28.3%)          | 171 (39.2%)                  | 231 (23.4%)       | <0.01   |
| Ever had insufficient pain medication               | 193 (13.6)           | 70 (16.1%)                   | 123 (12.5%)       | 0.07    |

ARYS, at risk youth study; Q, quartile.

\* Indicates activities/behaviours in the 6 months prior to interview.



**Table 2.**

Univariable and multivariable analysis of factors associated with ever having reported illicit drug use in the hospital ( $n = 1422$ )

| Characteristic  | Odds ratio (OR)        |                      |
|---|------------------------|----------------------|
|   | Unadjusted OR (95% CI) | Adjusted OR (95% CI) |
| <i>Main exposure</i>  |                        |                      |
| Percentage* of at least daily non-medical prescription opioid use over time (per one-unit increase) | 4.52 (2.07–9.92)       | 3.42 (1.46–8.02)     |
| <i>Covariates</i>   |                        |                      |
| Cohort (ARYS vs. VIDUS or ACCESS)   | 0.57 (0.40–0.79)       | 0.87 (0.58–1.27)     |
| Age (per 10-year increase)  | 0.95 (0.86–1.05)       | –                    |
| Sex (male vs. female)   | 0.64 (0.51–0.81)       | 0.68 (0.53–0.87)     |
| Percentage* of injection drug use of any substance over time (per one-unit increase)                | 2.69 (1.98–3.67)       | 0.87 (0.56–1.36)     |
| Percentage* of at least daily heroin use over time (per one-unit increase)                          | 3.53 (2.31–5.40)       | 1.54 (0.90–2.64)     |
| Percentage* of at least daily cocaine use over time (per one-unit increase)                         | 6.48 (3.15–13.55)      | 3.33 (1.51–7.39)     |
| Percentage* of at least daily crystal methamphetamine use over time (per one-unit increase)         | 1.05 (0.48–2.19)       | —                    |
| Percentage* of at least daily marijuana use over time (per one-unit increase)                       | 0.92 (0.64–1.30)       | —                    |
| Percentage* of enrolment opioid agonist therapy over time (per one-unit increase)                   | 2.42 (1.85–3.16)       | 2.31 (1.70–3.14)     |
| Percentage* of binge drug use over time (per one-unit increase)                                     | 2.23 (1.45–3.44)       | 1.11 (0.67–1.82)     |
| Percentage* of public drug use over time (per one-unit increase)                                    | 5.11 (3.40–7.70)       | 3.48 (1.98–6.14)     |
| Ever had insufficient pain medication (yes vs. no)  | 1.34 (0.97–1.84)       | 1.39 (0.99–1.94)     |

ACCESS, AIDS Care Cohort to Evaluate Exposure to Survival Services; ARYS, at risk youth study; CI, confidence interval; VIDUS, Vancouver Injection Drug Users.

\* Percentage defined as the cumulative percentage of reported behaviour in the past 6 months during the cohort study period.