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# Opioid medication doses among safer supply clients: Current safer supply doses and previous OAT experience

Gillian Kolla [a,b,*], Kaitlin Fajber [c], Andrea Sereda [c,d], Cassidy Morris [c], Perri Deacon [e,f], Lauren E. Cipriano [g,h,i]

[a] Faculty of Medicine, Memorial University, St. John's, Newfoundland and Labrador, Canada
[b] Canadian Institute for Substance Use Research, University of Victoria, Victoria, British Columbia, Canada
[c] London Intercommunity Health Centre, London, Ontario, Canada
[d] Department of Family Medicine, Schulich School of Medicine and Dentistry, Western University, London, Ontario, Canada
[e] Department of Family and Community Medicine, University of Toronto, Toronto, Ontario, Canada
[f] HQ Toronto, Toronto, Ontario, Canada
[g] Ivey Business School, Western University, London, Ontario, Canada
[h] Department of Epidemiology and Biostatistics, Schulich School of Medicine & Dentistry, Western University, London, Ontario, Canada
[i] Department of Medicine, Schulich School of Medicine & Dentistry, Western University, London, Ontario, Canada

## HIGHLIGHTS

- Safer supply clients had substantial previous experience with high dose opioid agonist treatment.
- Most SOS clients were prescribed immediate release hydromorphone with long-acting opioids.
- Total average doses of SOS prescriptions were similar to high dose methadone.

## ARTICLE INFO

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## ABSTRACT

*Introduction:* Safer opioid supply (SOS) is a harm reduction approach to prescribing pharmaceutical opioids to people at high risk of overdose from the toxic unregulated drug supply. Previous research demonstrates positive health outcomes and reductions in overdose mortality among SOS clients; however few reports describe previous opioid agonist treatment history prior to initiating SOS, or the medication combinations and doses prescribed within SOS programs.

*Methods:* We used convenience sampling to collect survey data from 95 SOS program clients in London, Canada. We use descriptive statistics to analyze survey data and report on OAT history prior to initiating SOS, including maximum methadone dose. We also report on current SOS medication combinations and doses.

*Findings:* Previous experience with OAT was common and reported by 87 % of SOS clients. Mean highest dose of methadone ever received was 95 mg (range: 20–200 mg), with close to 40 % reporting doses of $\geq$ 120 mg. 95 % of SOS clients reported prescriptions for immediate-release tablet hydromorphone; 28 % were receiving hydromorphone monotherapy; 68 % were receiving hydromorphone alongside a long-acting opioid, and 5 % receiving hydromorphone alongside 2 long-acting opioids. Total average milligram morphine equivalent (MME) doses of combination SOS prescriptions (MME 1616) were similar to high dose methadone (120 mg = MME 1440).

*Conclusions:* Previous high dose OAT experience was common among SOS clients prior to enrollment in the SOS program. Our results may inform the individualization of high dose opioid prescriptions for people with high tolerance due to exposure to unregulated fentanyl.

* Correspondence to: Division of Population Health and Applied Health Sciences, Faculty of Medicine, Memorial University, 300 Prince Philip Drive, St. John's, Newfoundland and Labrador A1B 3V6, Canada.
*E-mail address:* gkolla@mun.ca (G. Kolla).

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## 1. Introduction

North America continues to face an overdose crisis driven by an increasingly toxic supply of unregulated drugs in street markets including fentanyl, fentanyl analogues, and benzodiazepines. Since 2016, over 47,000 people have died from overdose in Canada, with overdoses from unregulated fentanyl and its analogues responsible for over 80 % of these overdoses in the most recent reporting period (Special Advisory Committee on the Epidemic of Opioid Overdoses, 2024). Newly released Canadian guidelines for the treatment of opioid use disorder (OUD) recommend either methadone or buprenorphine-naloxone as first line treatment, with sustained-release oral morphine (SROM) as second-line treatment (Yakovenko et al., 2024). For patients retained in treatment, opioid agonist therapy (OAT), specifically methadone and buprenorphine-naloxone, has been shown to be protective against opioid-related mortality, including in the fentanyl era (Pearce et al., 2020; Santo et al., 2021). Yet there is a critical gap in engaging and retaining individuals with OUD in OAT, with low retention prior to the fentanyl era and evidence of decreasing retention in recent years (Eibl et al., 2015; Elnagdi et al., 2023; Gomes et al., 2022; Nosyk et al., 2022, 2024; Paul et al., 2023; Piske et al., 2020), as well as persistent issues with inadequate therapeutic doses of methadone (Artenie et al., 2019). Additionally, people with opioid use disorder engage with first-line opioid agonist therapy repeatedly; program retention rates decrease with each subsequent treatment cycle (Nosyk et al., 2009). While OAT is an effective treatment option for some people with opioid use disorder, issues with inadequate therapeutic doses of methadone and low retention to treatment suggest that many who have tried OAT still have unmet needs and are at risk of overdose, particularly during the current era of catastrophic rates of overdose mortality across North America (Bromley et al., 2021; Kolla et al., 2022; Piske et al., 2020). There is need to explore prior experience with OAT among people receiving novel interventions like safer opioid supply, as well as to improve existing treatment delivery options to retain people who use drugs in healthcare and reduce the risk of fatal overdose.

Safer opioid supply (SOS) is an additional harm reduction intervention for individuals with complex health needs, including people with multiple previous attempts at OAT treatment who remain at high risk of overdose mortality due to continued use of fentanyl acquired from unregulated markets. In SOS programs, people who are using unregulated fentanyl and are at high risk of overdose are prescribed pharmaceutical opioids with a goal of reducing use of unregulated opioids and related overdose risk. In the province of Ontario, SOS is frequently delivered by primary care providers in low-barrier healthcare settings (Atkinson, 2023; Gomes, Kolla, et al., 2022; Haines et al., 2022; Haines and O'Byrne, 2023; Kolla et al., 2021; Kolla and Fajber, 2023; Perri et al., 2023; Schmidt et al., 2023, 2024). Prescriptions most commonly include daily-dispensed immediate release (IR) tablet hydromorphone alongside a witnessed dose of long-acting opioid (frequently sustained release oral morphine (SROM), but also methadone) and are delivered concurrently with an array of other health and social services based on individual need (Kolla et al., 2021; Schmidt et al., 2024; Young et al., 2022). Medications prescribed within SOS programs are prescribed off-label and include IR hydromorphone 8 mg tablets (available from 3 manufacturers, all priced at $0.35 per 8 mg tablet based on publicly available pricing on the Ontario Drug Formulary) and sustained release oral morphine (brand name Kadian, at cost of $2.87 per 100 mg capsule) (Government of Ontario, 2024). Close to 90 % of SOS patients receive their medications through prescription drug coverage from the Ontario Drug Benefits Program (Gomes et al., 2022). Some Ontario SOS programs received federal funding as pilot initiatives to pay for some health and social support staff such as nurse practitioners, nurses and outreach workers (Karamouzian et al., 2023), with physicians paid through a salary model (if working in community health centres) or on a fee-for-service model from the Ontario Health Insurance Program. To our knowledge, there are no programs in Ontario who receive funding or support of any kind from pharmaceutical companies.

Research and evaluations of SOS programs report that individuals accessing prescribed safer supply have: reduced illicit drug use and related overdose risk; increased uptake of health services and subsequent improvements in physical and mental health outcomes; improved financial and housing stability; and an increased sense of stability and control over their substance use (Atkinson, 2023; Haines et al., 2022; Ivsins et al., 2021; Kolla et al., 2021; Ledlie et al., 2024; McMurchy and Palmer, 2022; Nafeh et al., 2023; Perri et al., 2023; Ranger et al., 2021; Schmidt et al., 2023). These self-reported outcomes align with quasi-experimental studies using provincial health administrative data. In Ontario, a comparison of SOS program clients and matched individuals with OUD not receiving safer supply found a significant reduction in emergency department visits, hospital admissions, and health care costs (not including costs for primary care or medications) following exposure to prescribed safer supply (Gomes et al., 2022). In British Columbia, analysis of administrative data found that individuals receiving a safer supply prescription experienced a significant reduction in overdose mortality (55–89 %) and all-cause mortality (61–91 %) in the first week following prescription (Slaunwhite et al., 2024).

While methadone can be effective for some patients and higher doses of methadone may improve retention, persistent issues with retention in methadone treatment even with higher doses may indicate that different options are necessary (Bromley et al., 2021; Piske et al., 2020). And despite rapid expansion of the evidence base on prescribed safer supply, there remains a gap in the reporting of the medication dose combinations prescribed within SOS programs. There is a need to describe and better understand the prior experience with OAT among SOS clients and compare current SOS regimens by dosage and combinations in order to better inform individualized high-dose opioid prescribing for those with fentanyl-related tolerance. Using self-reported survey data from SOS clients in London, Canada, the main objectives of our study are to examine: 1) SOS client history of receiving OAT, including maximum methadone dose ever received, to assess whether sub-optimal dosing may have contributed to first-line treatment failure prior to initiating SOS, and; 2) current opioid combinations and doses being received in SOS programs.

## 2. Methods

Cross-sectional, interviewer-administrated survey data was collected using a convenience sample of Safer Opioid Supply (SOS) clients as part of an ongoing internal program evaluation and quality improvement activities at the London Intercommunity Health Center (LIHC) in Ontario, Canada. While SOS prescribing to a small number of patients at LIHC began in 2016 without dedicated funding for wrap-around health and social services (Gomes et al., 2022), in 2020 the program received federal funding to support program expansion and program evaluation (Kolla et al., 2021). At the time of data collection it had 239 clients (Kolla and Fajber, 2023). All program evaluation activities are designed in collaboration with a community advisory group to center the voices of SOS clients in program delivery.

Self-reported surveys (n = 95) using convenience sampling were conducted with clients of the SOS program in February 2023 by an external evaluator conducting ongoing program evaluation (GK) and an LIHC practicum student who did not provide client services or care (KF). GK trained KF in survey data collection and they worked closely together when preparing for data collection and while in the field. The survey tool consisted primarily of multiple-choice questions and survey training protocols included survey practice and observation to ensure consistency in approach. The survey tool used for this study was adapted from a previous SOS program evaluation and developed in collaboration with an advisory group of LIHC clients who advised on appropriateness of questions, and to ensure clarity and accuracy of the questions. The survey tool was also pilot tested, with minor modifications made to

ensure the questions were clear and response options were accurate. Data collection was spread over two weeks and on different days of the week to maximize client diversity (as clients are assigned a 'day of the week' for regular appointments) and to ensure clients who attend appointment either weekly or once every 2 weeks were sampled. LIHC staff members (non-prescribers) provided information on the evaluation to all clients when clients checked into the clinic for appointments. If interested, clients were directed to the evaluators for more information. Selection bias was mitigated by having staff invite all clients who came for appointments to participate. GK and KF obtained consent from all clients who were interested in completing the survey and collected data in a separate room in a non-clinical area of the health centre; the consent form was reviewed with clients and all questions answered before completing the survey. The survey was interviewer-administered to reduce non-response and missing data. Survey data was anonymous and the ability to end the survey at any time was stressed to participants, in line with best practices for conducting ethical quality improvement projects (Hunt et al., 2021). Clients were compensated $20 CAD for their time. Research ethics approval was obtained from the Newfoundland and Labrador Health Research Ethics Board.

Descriptive methods were used to analyze the data. Survey questions included demographics and previous experience with OAT (specifically methadone and buprenorphine formulations) including the highest dose ever received of each medication; current use of street drugs; and current prescribed safer supply medications. While other medication combinations were reported, due to the small numbers of clients reporting these combinations (less than 10 in each category), those numbers are not reported to maintain client anonymity and due to ethical concerns that clients may be identifiable by specific combinations.

We report on previous doses of methadone received by clients and on current doses being prescribed in the SOS program. We also converted doses to milligrams of morphine equivalence (MME) to facilitate comparison between opioid medication doses using accepted opioid conversion ratios. The majority of published ratios are conversion tables adapted for pain control and not for the treatment of opioid use disorder; as bioavailability, pharmacokinetics and pharmacodynamics all influence the perceptions of medication and equianalgesic effect, caution must be used when employing conversions developed to guide opioid prescribing for pain to guide prescribing for people with opioid use disorder with underlying high opioid tolerance (McPherson, 2018). In order to address the inherent limitations of conversion ratios, we provide both dose of medications in the formulation they are prescribed as well as conversion to MME. Oral hydromorphone is converted to MME at a conversion ratio of 1:5 (HDM mg x 5 = MME) (McPherson, 2018). There is limited information on conversion of opioid medications specific to the treatment of opioid use disorder; one well-designed cross--over study examining non-inferiority of slow release oral morphine compared to methadone used a dose conversion of 1:6 and 1:8 to guide oral methadone to oral slow release oral morphine (SROM) cross-over, and found on average that methadone doses were converted to SROM at a mean ratio of 1:7.7 ± 1.3 (Beck et al., 2014). The unique pharmacokinetics of methadone present challenges when converting to MME and must be interpreted cautiously (McPherson, 2018). After consultation with several resources on conversion of methadone to milligram morphine equivalents (MME), in this report we convert doses of methadone above 51 mg to MME using a ratio of 1:12 methadone: MME (Ayonrinde and Bridge, 2000; College of Physicians and Surgeons of British Columbia, 2022; Mercadante et al., 2001; McPherson, 2018). This provides conversions of: 60 mg methadone = 720 MME; 90 mg methadone = 1080 MME; 120 mg methadone = 1440 MME.

## 3. Results

Data was obtained from 95 clients of the LIHC SOS program, representing 41 % of the program's enrolled clients. Among surveyed clients, 54 % were female, with a mean age of 43.6 years and 42 % having experienced homelessness in the previous 6 months; demographics of surveyed clients were consistent with overall program demographics in terms of average age and gender (Table 1).

Previous experience with OAT prior to beginning the SOS program was common. Among all participants (n = 95), 87 % of SOS clients reported receiving any previous OAT prescription; 81 % of clients reported previously receiving methadone, 40 % previously received buprenorphine-naloxone, and 34 % had previously been prescribed both. Overall, among clients who had received methadone (n = 77), the

**Table 1**
SOS client characteristics - February 2023.

| *SOS Client Characteristics* | *Number (%) of SOS clients n = 95* |
|---|---|
| Age, year; mean (range) | |
| Mean | 43.6 (22–65) |
| Gender | |
| Men | 43 (45 %) |
| Women and transgender* | 52 (55 %) |
| Race/Ethnic group* * | |
| Indigenous or other racialized group* ** | 28 (29 %) |
| White | 68 (71 %) |
| Length of time on SOS | |
| 1 year (started in 2022) | 17 (18 %) |
| 2 years (started in 2021) | 16 (17 %) |
| 3 years (started in 2020) | 25 (26 %) |
| 4 years (started in 2019) | 20 (21 %) |
| 5 years (started in 2018) | 6 (6 %) |
| 6 years (started in 2017) | 6 (6 %) |
| 7 years (started in 2016) | 5 (5 %) |
| Housing Status | |
| Homeless (rough sleeping/shelter/couch surfing) | 40 (42 %) |
| Housed | 54 (57 %) |
| Declined to answer | 1 (1 %) |
| Income Support | |
| Receiving Government Income Support | 89 (94 %) |
| Not Receiving Government Income Support | 4 (4 %) |
| Declined to answer | 2 (2 %) |
| ***Previous experience of opioid agonist treatment (OAT)*** | |
| Ever prescribed OAT (either methadone or buprenorphine) | 83 (87 %) |
| Ever prescribed methadone | 77 (81 %) |
| Highest ever dose; mean (range) | 95 mg (20–200 mg) |
| Highest ever dose; median (IQR) | 90 mg (70–120 mg) |
| Highest ever dose 60 mg or higher | 65 (84 %) |
| Highest ever dose 90 mg or higher | 40 (52 %) |
| Highest ever dose 120 mg or higher | 29 (38 %) |
| Ever prescribed buprenorphine/naloxone (Suboxone) | 38 (40 %) |
| Ever prescribed methadone and buprenorphine | 32 (34 %) |
| ***Injected fentanyl (last 6 months)*** | |
| Yes | 25 (26 %) |
| No | 70 (74 %) |
| Currently injecting fentanyl daily | 11 (12 %) |
| ***Smoked Fentanyl (last 6 months)*** | |
| Yes | 69 (73 %) |
| No | 25 (26 %) |
| Declined to answer | 1 (1 %) |
| Currently smoking fentanyl daily | 47 (50 %) |
| ***Most common method of fentanyl consumption (last 6 months)*** | |
| Only injection | 2 (2 %) |
| Mostly by injection | 3 (3 %) |
| Only smoking | 45 (47 %) |
| Mostly smoking | 22 (23 %) |
| About equal amounts injection and smoking | 3 (3 %) |
| No fentanyl use | 18 (19 %) |
| Declined to answer | 2 (2 %) |

* As there were fewer than 5 transgender people in the sample, the precise number is not reported and has been combined with women
* *Clients could identify with multiple racial or ethnic identities
* ** As there were fewer than 5 people reporting a racial or ethnic group other than Indigenous, the precise number is not reported and has been combined with Indigenous people

mean highest dose ever received was 95 mg (range: 20–200 mg), with 87 % reporting a highest ever dose of 60 mg or higher, 53 % a highest ever dose of 90 mg or higher, and 39 % a highest ever dose of 120 mg or higher.

While the SOS program is a harm reduction intervention that does not require clients to cease use of drugs such as fentanyl, clients were asked about use of fentanyl from unregulated street sources in the past 6 months. Among clients surveyed (n = 95), 19 % reported no use of unregulated fentanyl, with the remainder reporting using fentanyl by injection, inhalation (i.e., smoking), or both. While 26 % of clients reported injecting fentanyl in the last 6 months, only 12 % reported daily injection. Fentanyl consumption by inhalation was more common, with 74 % reporting smoking fentanyl in the last 6 months, and 50 % reporting daily smoking.

Almost all clients surveyed (91.5 %; n = 95) reported receiving IR tablet hydromorphone as part of their SOS medication regime (Table 2); remaining clients reported having received IR tablet hydromorphone in the past but not at the time of data collection, and were currently receiving methadone, buprenorphine-naloxone, SROM, or long-acting hydromorphone (Hydromorph Contin). Among those who reported receiving hydromorphone (n = 87), 28 % reported receiving only IR tablet hydromorphone. All other patients reported combination therapy regimens: 55 % reported receiving IR tablet hydromorphone in combination with SROM, 13 % reported receiving IR tablet hydromorphone and other long-acting opioids, and a small number (5 %) reported receiving IR tablet hydromorphone alongside two long-acting opioids (SROM and either methadone, fentanyl patches or long-acting hydromorphone).

Among clients receiving only IR tablet hydromorphone (n = 24), mean daily dose was 196 mg (24.5×8 mg tablets), or an MME of 978 (using a conversion of hydromorphone to MME of hydromorphone mg x 5; McPherson, 2018). Among clients receiving IR hydromorphone plus SROM (n = 48; the most common combination), mean daily dose of IR hydromorphone was 211 mg (26.4×8 mg tablets) in combination with a mean daily dose of SROM of 560 mg, for a total mean MME of 1616. Among clients receiving IR tablet hydromorphone (N = 87), 72 % reporting daily dispensing of their medications. Additionally, when asked how they administered their medications (n = 94), 50 % of clients reported that oral use was their most common method of administering their medications, with 32 % reporting injection of IR tablet hydromorphone.

**Table 2**
Client-reported medications and doses in milligrams (mg) and milligrams of morphine equivalents (MME).

| | Number (%) | Mean Hydromorphone IR Dose mg(range) | Mean Hydromorphone IR dose (MME)** | Mean SROM Dose mg(range) | Mean Combined (MME)** |
|---|---|---|---|---|---|
| | ***n = 95*** | | | | |
| Clients receiving hydromorphone IR | 87 (91.5 %) | 205 (32–400) | 1027 | - | - |
| Clients receiving SROM | 52 (54.7 %) | | | 575 (10–1600) | |
| ***Medication Combinations and Doses among clients receiving IR hydromorphone*** | ***n = 87*** | | | | |
| Hydromorphone IR only | 24 (27.6 %) | 196 (40–382) | 978 | - | - |
| Hydromorphone IR + SROM | 48 (55.2 %) | 211 (32–400) | 1056 | 560 (10–1500) | 1616 |
| Hydromorphone IR + non-SROM long-acting opioid* | 11 (12.6 %) | 200 (128–248) | 1000 | - | * ** |
| Hydromorphone IR + SROM + non-SROM long-acting opioid* | 4 (4.6 %) | 202 (160–288) | 1010 | 733 (200–1600) | * ** |
| ***Number of hydromorphone IR tablets (8 mg) prescribed daily*** | ***n = 86*** | | | | |
| 1–10 tablets | 6 (7.0 %) | | | | |
| 11–20 tablets | 20 (23.2 %) | | | | |
| 21–30 tablets | 39 (45.3 %) | | | | |
| 31–40 tablets | 15 (17.4 %) | | | | |
| 41–50 tablets | 6 (7.0 %) | | | | |
| ***Dispensing frequency: hydromorphone IR*** | ***n = 87*** | | | | |
| Daily | 63 (72.4 %) | | | | |
| 2–3 Times Per Week | 14 (16.1 %) | | | | |
| Weekly | 10 (11.5 %) | | | | |
| ***Most common method of consumption of IR hydromorphone (last 6 months)*** | ***n = 94*** | | | | |
| Only or mostly taken orally | 47 (50.0 %) | | | | |
| Only or mostly taken by injection | 30 (31.9 %) | | | | |
| Only or mostly taken by smoking or snorting | 2 (2.1 %) | | | | |
| Approximately equal amounts taken orally and by injection | 11 (11.7 %) | | | | |
| Other (i.e. combinations of oral, smoking, snorting, injection) | 4 (4.3 %) | | | | |

* Non-SROM long acting opioids include: methadone, fentanyl patches, long-acting hydromorphone (Hydromorph Contin)
* * Hydromorphone converted to MME using conversion of HDM mg x 5
* ** Due to difficulties converting both methadone and fentanyl patches to MME, the combined MME is not reported here

## 4. Discussion

Safer opioid supply programs provide prescriptions for short-acting opioids (i.e. IR tablet hydromorphone), either alone or in combination with long-acting opioids to people using unregulated fentanyl who are at high risk of overdose. Consistent with previous research using data from health administrative databases (Young et al., 2022), our self-reported data indicate a high proportion of SOS clients have previously received OAT, with 87 % previously prescribed OAT and one-third (34 %) having tried both first-line OAT medications (methadone and buprenorphine) at least once each prior to initiating SOS.

OAT retention is worsening in the fentanyl era (Paul et al., 2023). Methadone doses that were often considered to be high in the pre-fentanyl era are not meeting the needs of individuals who have had sustained exposure to highly potent fentanyl and fentanyl analogues from the unregulated drug market (Bromley et al., 2021). Consistent with these findings, among clients who reported previously receiving methadone, 84 % of those clients had previously received methadone doses of $\geq$ 60 mg/day, 53 % doses of $\geq$ 90 mg/day, and 39 % doses of $\geq$ 120 mg/day. Compared to current clinical guidance, these doses – particularly the 39 % of clients on doses at or above 120 mg/day - would be considered high, as Canadian guidelines during the time of data collection recommend a typical stabilization dose range of between 60 and 120 mg/day (Bromley et al., 2021; Bruneau et al., 2018).

Additionally, there has been concern that OAT dosing guidelines from the pre-fentanyl era may be inadequate for individuals with sustained exposure to high dosages of unregulated fentanyl, leading to newer recommendations to add SROM to methadone within OAT programs (Bromley et al., 2021). Critics of safer supply programs have suggested increased methadone access with higher doses as an alternative to safer supply programs (Carroll, 2020; del Pozo and Rawson, 2020; Lembke, 2020). Our results show that among the complex patients with severe opioid use disorder in SOS programs, it was common to have received high doses of methadone prior to enrolling in safer supply. This observation counters the notion that increased access to methadone alone will be sufficient to address retention challenges in OAT. In addition to inadequate dosing, previous research on OAT retention suggests it is also negatively impacted by policies restricting take-home doses, clinical practices that can be experienced as stigmatizing such as observed urine drug screening, lack of low barrier methadone programs, methadone not being a preferred medication, and negative and stigmatizing treatment when receiving healthcare and substance use treatment (Carl et al., 2023; Frank et al., 2021; Michener et al., 2024; Woo et al., 2017). While methadone can be effective for some patients and higher doses of methadone may improve retention, persistent issues with retention even with higher doses and decreasing retention rates when patients engage in a subsequent treatment cycle suggests that different options are necessary (Bromley et al., 2021; Nosyk et al., 2009; Piske et al., 2020). The results of this study reinforce the growing evidence base that suggests a gap in current treatment options, and that prescribed safer supply may be a complementary additional option alongside existing OAT programs to support people at high risk of overdose from fentanyl, particularly for a group of people with significant clinical complexity (Gomes et al., 2022; Ledlie et al., 2024; Min et al., 2024; Socias et al., 2023).

Milligrams of morphine equivalence (MME) is a standardized measure used to compare equianalgesic effects of opioid medications, however it must be interpreted prudently due to challenges with direct dose equivalence (McPherson, 2018). Methadone conversion to MME must be interpreted particularly cautiously due to the unique pharmacokinetics of methadone; however, a dose of 120 mg of methadone (MME 1440) is comparable to doses being received by safer supply clients who are receiving a combination of IR tablet hydromorphone IR and SROM (mean combined MME 1616). Current SOS doses are therefore comparable to doses of methadone currently prescribed to treat people with high opioid tolerance due to exposure to fentanyl in the unregulated drug supply (Bromley et al., 2021). Our findings of high previous methadone doses and comparable doses (based on MME) of IR tablet hydromorphone being prescribed in this safer supply program reinforce the concern that the permeation of Canada's unregulated drug supply with highly potent fentanyl and fentanyl analogues has led to high levels of opioid tolerance.

Notably, though OAT and prescribed safer supply are frequently presented as distinct approaches, they may also be complementary: prescribed safer supply programs in Canada commonly prescribe IR tablet hydromorphone in combination with long-acting opioids (Slaunwhite et al., 2024; Young et al., 2022). Additionally, continuous receipt of OAT medications was positively associated with 60-day adherence to safer supply medications in a safer supply program in British Columbia (Selfridge et al., 2022). Similarly, changes to British Columbia policy to improve accessibility of OUD medications at the start of the COVID-19 pandemic resulted in the co-prescribing of IR tablet hydromorphone to people receiving OAT, which led to better retention among people receiving OAT despite intensified barriers to access due to pandemic-related restrictions (Min et al., 2024; Socias et al., 2023). This suggests that prescribing IR tablet hydromorphone to people currently prescribed long-acting opioids within OAT treatment may improve retention, highlighting the potentially complimentary nature of OAT and safer supply in certain populations (Min et al., 2024).

In this study, almost one third (30 %) of clients receiving IR tablet hydromorphone reported injecting their medications. Coverage of high dose injectable formulations of hydromorphone necessary for injectable opioid agonist treatment (iOAT) is not available in Ontario (the province where this study took place), limiting the range of available treatment options (Kolla and Fajber, 2023). There is a strong evidence-base on the effectiveness of iOAT (Oviedo-Joekes et al., 2009, 2016) and the ability to offer injectable medication options is an important part of providing person-centred care that meets a variety of needs (Jaffe et al., 2023). Additionally, 81 % of participants reported using fentanyl at least once in the past 6 months (26 % by injection and 74 % by smoking). Ongoing use of the unregulated supply could be indicative of hydromorphone not being strong enough to match the potency of unregulated fentanyl (Kolla et al., 2024; Ivsins et al., 2020). Additionally, the high amounts of fentanyl smoking reported by participants in this study compared to injecting suggests the need to provide medications that can be smoked (i.e., powder heroin or fentanyl) (Bardwell, 2022; Kolla and Fajber, 2023). People who use drugs have been highlighting the need for prescribed safer supply in a wide-range of formulations and doses appropriate for each individual; our results support the need for access to a range of medications (including fentanyl formulations) and administration options (i.e. injectable, oral and smokeable/inhalable formulations) to allow clinicians to individualize dosing to best enhance the provision of person-centered care, and this may also help to improve outcomes such as client retention (Giang et al., 2023; Xavier et al., 2023).

Limitations to this study include the use of self-reported client data which may be subject to recall or social desirability bias. To mitigate this, the questions regarding past treatment experiences were designed to be as simple as possible. Additionally, interviewers found that recall for past methadone doses and current safer supply prescriptions was provided quickly and without hesitation, in comparison to previous buprenorphine-naloxone doses which clients frequently could not recall well. This analysis is also limited as it reports data from a relatively small sample size of 95 clients and cannot be extrapolated to client populations in other safer supply programs or in provinces where prescribed safer supply is more broadly offered in a variety of program models and settings. Finally, the sample is from a medium-sized Canadian city with a specific local context that includes accessible OAT, and a long-running safer supply program (since 2016). Due to these factors, generalizability may be limited.

## 5. Conclusion

While OAT is the first-line treatment option for OUD, safer opioid supply (SOS) prescribing offers an additional and potentially complementary approach to meet the diverse needs of people who use drugs. In an Ontario SOS program, it was common for clients to have previously been prescribed high-dose OAT prior to enrollment in the SOS program. Comparable MME across past methadone doses and current safer supply prescriptions suggests that, beyond prescription of opioid medications, the patient-centered and harm reduction philosophy of this SOS program that includes comprehensive wrap-around primary care and social supports may address some of the accessibility and retention challenges experienced with OAT. Because people who use drugs are a diverse population with varied needs, a comprehensive range of options and interventions focused on patient-centered care that includes easy access to both OAT and SOS, as well as injectable OAT programs, is needed to address the toxic drug supply crisis. Future research should investigate gaps and opportunities for bridging OAT and SOS to best care for individuals at high risk of overdose-related mortality.

## CRediT authorship contribution statement

**Sereda Andrea:** Writing – review & editing, Methodology, Conceptualization. **Fajber Kaitlin:** Writing – review & editing, Writing – original draft, Formal analysis, Conceptualization. **Deacon Perri:** Writing – review & editing, Conceptualization. **Morris Cassidy:** Writing – review & editing, Methodology, Conceptualization. **Cipriano Lauren E:** Writing – review & editing, Supervision, Methodology, Formal analysis, Conceptualization. **Kolla Gillian:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

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## Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Gillian Kolla has received funding from LIHC's Substance Use and Addictions Program grant to conduct program evaluations of the Safer Opioid Supply program. The remaining authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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